CHAPTER SIX
COMBINED ARMS AFTER 1945

By 1945, the victorious armies of the United Nations had developed a very sophisticated, equipment-intensive form of combined arms mechanized war. Even in the Pacific theater, the Americans and British used generous amounts of air power, specialized landing craft, and armored vehicles to support their infantry operations. Yet during the immediate postwar years, the same armies faced two trends that argued against the mechanized, armored solution to the problems of combined arms combat. First, the destructive power of the atomic bomb convinced many strategists that traditional land combat was obsolete and caused others to expect radical modifications to any future land combat. The atomic weapon made dense concentrations of ground forces on narrow frontages extremely dangerous and caused the air power advocates of the world to regard air-ground cooperation as even less important than they had previously viewed it, because the super weapon seemingly made close air support unnecessary. Especially during the late 1940s, when the United States had a nuclear monopoly, the future role of armies appeared to be to secure the bases for strategic bombers before a war and to mop up and occupy enemy territory after a nuclear bombing. Until the early 1950s, technological limitations restricted the design and production of truely small-yield, tactical nuclear weapons. Thus by definition nuclear warfare meant using large-scale, strategic nuclear weapons; consequently, ground combat fell into neglect.

The second, and opposing, challenge to the mechanized armies of 1945 was the so-called "war of national liberation" that employed unconventional warfare tactics. During the later 1940s, insurgencies in China, Indo-China, Greece, and Malaya made conventional armies appear too expensive and too musclebound to compete efficiently against the politicized peasant outfitted with a rifle and a bag of rice. To meet this challenge, western armies had to neglect the development of new generations of expensive armored weapons in favor of renewed interest in increased mobility for light infantry forces. The French in Indo-China and Algeria, and the British in Malaya, Kenya, and Aden, were clearly distracted from the mechanized trends of 1945. In the 1960s, the Europeans were again able to focus on home defense in an intensive, mechanized war, but almost simultaneously the U.S. became involved in Vietnam. Not until the mid-1970s were all the NATO Allies actively studying and developing doctrine for their own defense in Europe. In the interim the Soviet Union had gone far to make up its previous technical disadvantages in conventional combat. Of course, some developments in counterinsurgency wars may have application in a more intense, mechanized environment. For example, despite the

potentially high air defense threat posed by Soviet-equipped forces, airmobility is clearly one of the major new tactical trends of the later 20th century.

Most major armies, including that of the Soviet Union, have been forced to adjust to the challenge of nuclear warfare or guerrilla insurgency, or both. The only major exception has been Israel, and even there persistent terrorism has posed a difficult problem for the mechanized Israeli forces. Thus, major themes in combined arms since World War II are difficult to identify. Different armies have faced the same problems, but rarely at the same time. This chapter will examine the postwar period from three different perspectives: the development of organization and doctrine in the Soviet Army, the experience of the United States and to a lesser extent its European allies, and finally the rapid development of the Israeli Defense Forces from guerrillas to armor-heavy conventional soldiers.

The Soviet Army, 1945-66: The Decline of Conventional Forces

The Soviet Army, as it was renamed after World War II, has experienced at least three distinct periods of doctrine and organization since 1945. First, from the end of the war to the death of Stalin in 1953, the Soviets demobilized a portion of their forces but continued with the same tactical and operational doctrines and organizations developed during the war. Second, from 1953 to approximately 1967, the ground forces took a back seat to the nuclear-equipped arms of the Soviet state. During this period, the Soviet Army shrank in size and neglected its historical experience in combined arms in favor of an armor-heavy force designed to survive and exploit nuclear strikes. Finally, since the late 1960s the Soviet Union has reversed this decline of land forces, restudied the experience of the "Great Patriotic War," and prepared for the possibility of an extensive, combined arms mechanized conflict with or without the use of nuclear weapons.[1]

Immediately after World War II, the Soviet Union had no nuclear weapons and therefore sought to refine its increasingly mechanized conventional forces for any European eventuality. At the time, this was the only possible Soviet counterweight to the U.S. nuclear monopoly. Although the Soviet Union demobilized from a total of over 500 division-sized units to approximately 175 divisions during the period 1945-48, the number of armored and mechanized units actually increased from thirty-nine to sixty-five. In the process, "tank corps" became tank divisions, and "mechanized corps" became mechanized divisions (see Figure 14).[2] Each of these divisions reflected the experience of World War II, including integration of tanks, self-propelled guns, infantry, artillery, and air defense at regimental level.

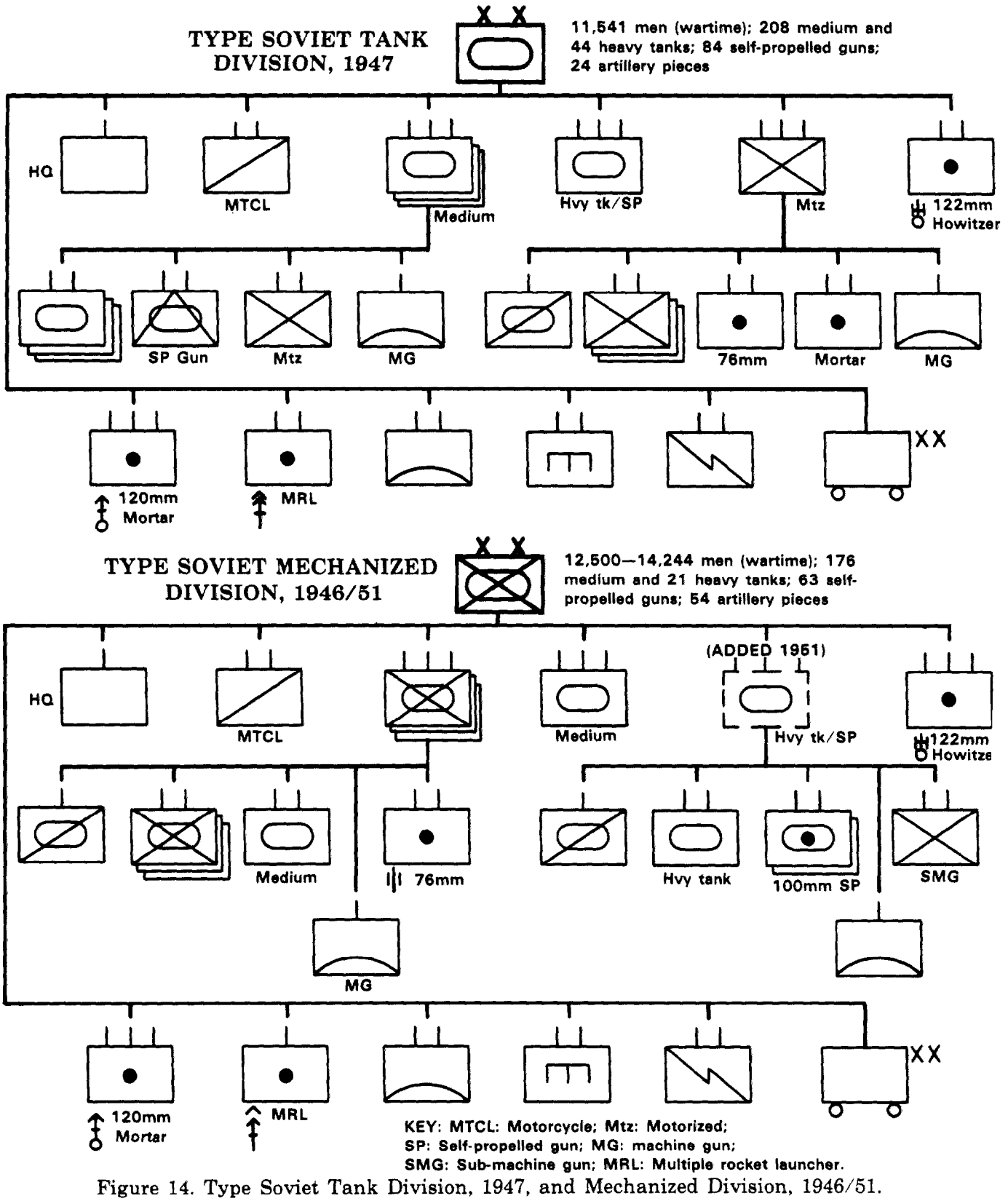

Figure 14. Type Soviet Tank Division, 1947, and Mechanized Division, 1946/51.

Indeed, the addition of a heavy tank/self-propelled gun regiment to the mechanized division in 1951 made this division almost too unwieldy for a small Soviet staff to control.

Simultaneously, the Soviets motorized their rifle divisions. The demobilization of 1945-48 allowed them to equip the remaining divisions completely with motor transportation, as evidenced by a three-fold increase in the number of trucks in a rifle division between 1944 and 1946. The first Soviet armored personnel carriers, the BTR-152 series, came into production in late 1945, but even the motorized rifle regiment of a tank division was truck-mounted until well into the 1950s. At that point, the tracked BTR-50 series came into production for the mechanized units, and apparently other motorized rifle units inherited the BTR-152.[3]

Soviet doctrine remained essentially unchanged until 1953. During this period the Soviets produced their first nuclear weapons, so that their conventional ground forces became less vital to national strategy. Then Stalin's death in 1953 allowed Marshal Georgi Zhukov to return to power within the armed forces.* By 1955, Zhukov had won government approval for a major reorganization of the ground forces. His primary goal was to adjust the ground forces to the realities of nuclear warfare. All units had to become smaller for better command and control, and better armored for protection against the effects of nuclear weapons. The tubed artillery preparations of the Great Patriotic War declined in significance, giving way to a doctrine that viewed mechanized, armor-heavy forces as the exploitation element after nuclear strikes had shattered the enemy defenses.

In the realm of organization, Zhukov abolished the rifle corps, the unwieldy mechanized division, the rifle division, and the remaining horse cavalry divisions. The motorized rifle division replaced both the mechanized and the rifle division. By 1958, only three types of division remained: tank, motorized rifle, and airborne rifle. Armies consisted only of three to four tank divisions in a tank army, or two to three motorized rifle divisions and one tank division in a combined arms army. Missile-equipped artillery and air defense replaced much of the conventional artillery of the Soviet Army.[4]

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*Because of his great prestige, Zhukov posed a potential political threat to Stalin. As a result, Stalin banished Zhukov to minor posts for a number of years after World War II.

At the same time, the influx of new equipment and the reduction in the overall size of the army meant that all units, with the exception of airborne divisions, were at least motorized and in many cases mechanized. The term "mobile group," which for three decades had designated cavalry and mechanized forces that were more mobile than conventional infantry, lost its meaning and fell out of use. The function of exploiting penetrations remained, however, becoming a role for the tank and motorized rifle divisions.

Perhaps most significantly, the entire concept of combined arms seemed less important once the Soviet Army decided that any future war would be a nuclear war. In particular, infantry as well as conventional artillery shrank within existing organizations. In 1947, for example, a typical "mechanized army" consisted of two tank and two mechanized divisions. Because all the maneuver regiments in these divisions had integrated infantry units, there was a total of thirty-four motorized or mechanized infantry battalions in this mechanized army. By contrast, the 1958 "tank army" consisted of only four tank divisions, and these four divisions had lost the motorized rifle battalions from their tank regiments. Consequently, the tank army had only twelve infantry battalions, all of them mounted in armored personnel carriers in part to shield them from the blast and radiation effects of nuclear weapons.[5]

Beginning in 1960, Nikita Khrushchev further slighted the conventional ground forces in favor of the "Strategic Rocket Forces." Individual army organizations, as well as the total strength of the army, declined to a postwar low of 140 small divisions. The Soviet Union appeared totally committed to the concept of the "single option," the expectation that any major war must be a nuclear war.

Rebirth of Soviet Combined Arms After 1967

Following Khrushchev's ouster in 1964, a debate began within the Soviet military about the general direction of military affairs. The exact causes of this debate remain unclear, although to some extent it may have been a response to the American doctrine of flexible response. This U.S. doctrine, which will be discussed below, called for military forces that would be capable of fighting along the entire range of possible conflicts, from terrorism and guerrilla warfare up to full conventional and even nuclear war. Regardless of the causes of the Soviet reappraisal, by 1966-67 the Kremlin had apparently determined that the "single option" was too simplistic. In January 1968, for example, Maj. Gen. S. Shtrik publicly announced that:

> a situation may arise in which combat operations begin and are carried out for some time (most probably for a relatively short duration) without the use of nuclear weapons, and only subsequently will a shift to operations with these weapons take place.[6]

To meet this possibility, the Soviet military renewed its study of conventional combined arms warfare. The government allowed many senior commanders of World War II to publish their memoirs, openly identifying the operational and tactical errors that the Soviets had made while fighting the Germans. More importantly, these memoirs focused on the continuing relevance of certain techniques of the Great Patriotic War. In particular, Soviet military scholars paid attention to the concepts of the mobile group and the forward detachment, both of which were key to Soviet methods of mechanized exploitation and pursuit. Although the term "mobile group" no longer applied in a fully mechanized Soviet Army, the functions involved remained relevant to conventional Soviet tactics.[7]

Soviet organization reflected these doctrinal and historical concerns. During the 1970s, Soviet tank regiments gradually regained the mechanized infantry and conventional artillery battalions that they had lost under Zhukov's regime. Perhaps most important, some Soviet divisions received a "new" formation, the separate tank battalion. Viewed as a pure tank unit, this battalion might seem to be an additional reserve for the division commander. Within the context of renewed Soviet interest in the Great Patriotic War, however, the separate tank battalion might well be the nucleus for a forward detachment in any future exploitation and pursuit.

Thus, by the mid-1970s the Soviet Union had come full circle in the doctrine and organization of combined arms combat. While the United States lost a decade of mechanized development because of its involvement in Vietnam, the Soviet Union had developed new generations of armored fighting vehicles to implement fully its long-standing doctrine of deep battle and mechanized combined arms.

The U.S. Army: Demobilization to Korea

In contrast to Soviet commanders in 1945, American field commanders were only partially satisfied with their organization and equipment. In 1945-46, the General Board of the U.S. European Theater of Operations conducted an exhaustive review of past and future organization. This review recognized the actual practices of the army in 1944-45, thereby departing from McNair's concepts to a considerable extent.

For example, in reviewing the performance of the triangular infantry division, both the General Board and the War Department concluded that armor should be organic to that division in order to provide support for infantry attacks and to act as the primary antitank weapon of the army. The infantry's 57-mm antitank gun seemed ineffective, and the tank destroyer was too specialized to justify in a peacetime force structure. In a reversal of previous doctrine, the U.S. Army concluded that "the medium tank is the best antitank weapon."[8] Although such a statement may have been true, it ignored the difficulties of designing a tank that could outshoot and defeat all other tanks. Moreover, even if the tank was the best antitank weapon, using it to defeat enemy armor might not be the best employment of available tanks, which found themselves tied to their own infantry instead of attacking and exploiting enemy vulnerabilities. In any event, each infantry regiment in the postwar U.S. Army received authorization for an organic tank company, with the division as a whole acquiring an additional tank battalion.

By the time the War Department finally approved a new infantry division structure in November 1946, a variety of changes had occurred based on wartime experience (Figure 15). The self-propelled antiaircraft machine guns and 4.2-inch mortars that had frequently provided fire support to the World War II division became organic to that division. Regimental cannon companies and antitank companies disappeared, but each infantry battalion received recoilless rifles. Even the infantry squad and platoon changed. After a conference at Fort Benning, Georgia, in 1946, the army reduced the rifle squad from twelve to nine men. This change not only facilitated the squad leader's control of his squad, but also released personnel to man a light machine gun and an antitank rocket launcher in the weapons squad of each reorganized platoon. These new platoons had a greater capacity for independent fire and maneuver than their wartime predecessors. On the other hand, the nine-man squad had little staying power once it suffered casualties.[9]

In the armored division, similar modifications occurred. The limiting factor in most armored operations during 1944-45 was the shortage of armored infantry, even in the smaller 1943 divisions. At the end of the war, Gen. George S. Patton estimated that the armored infantry suffered 65 percent of all casualties in these divisions while inflicting only 29 percent of the German casualties.[10] Conventional infantry and armored engineers found themselves pressed into service to perform the infantry's close security and urban combat functions for armored task forces. In 1946, the War Department therefore increased the armored infantry in each armored division from three battalions of three companies each to four battalions of four companies each.

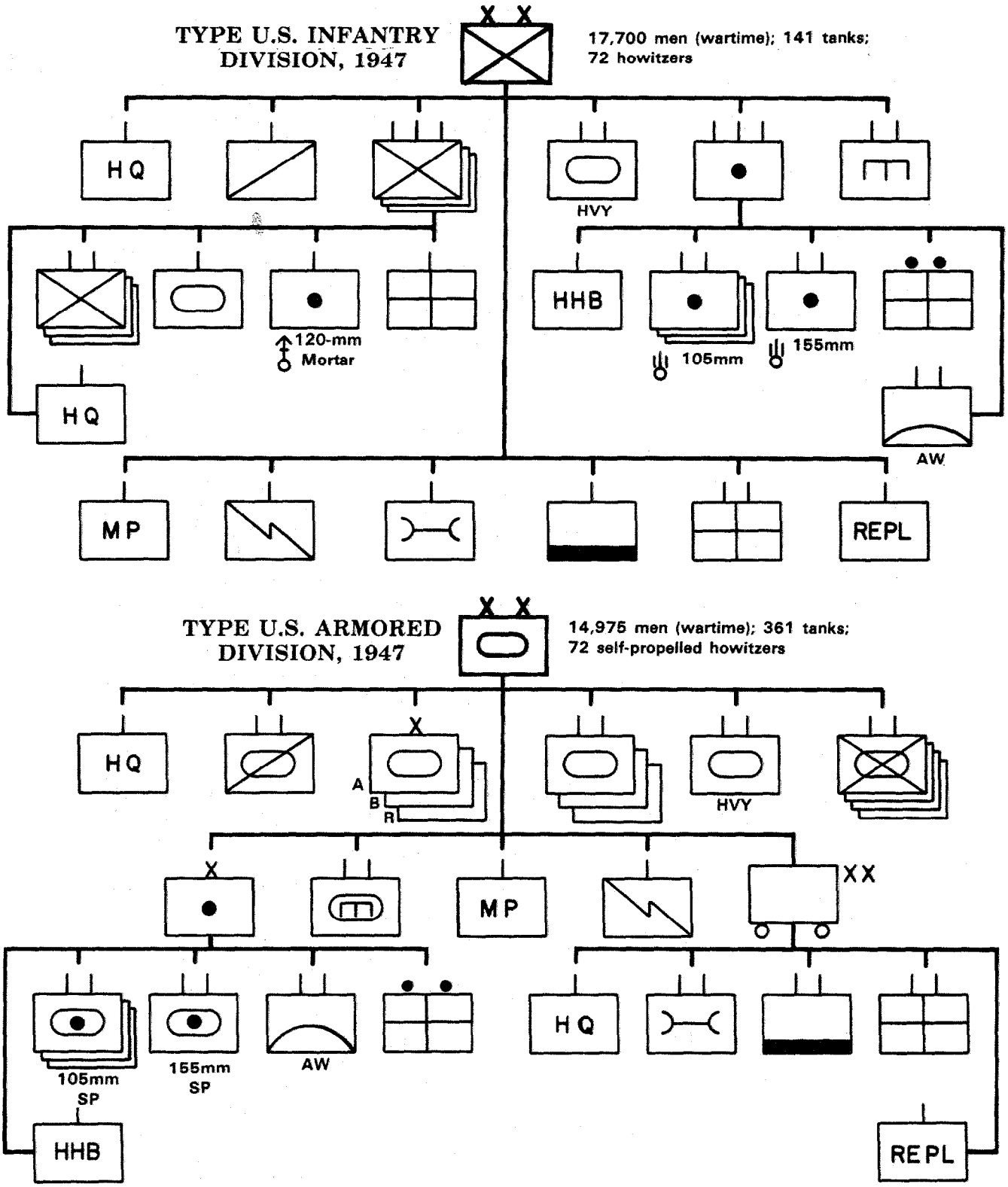


Figure 15. Type U.S. Infantry and Armored Divisions, 1947.

Just as in the infantry division, the postwar armored division acquired a number of units that had previously been attached to it. A "heavy" tank battalion, actually equipped with M26 medium tanks because of their 90-mm high-velocity guns, replaced the departed tank destroyers as the antitank element of an armored division. Battalions of 155-mm self-propelled artillery and self-propelled antiaircraft machine guns also became organic. The three armored engineer companies of the World War II division had proved inadequate for mobility missions, let alone for doubling as armored infantry, and so the postwar engineer battalion received a fourth line company and a bridge company. The two truck companies normally attached to any armored division were not added as separate units, but the division's available wheeled transportation certainly grew during the postwar reorganization. To cite but one example, the number of two and one-half ton cargo trucks increased from 422 in 1943 to 804 in 1947.[11]

Most of these notable improvements in the combination of arms were stillborn because of postwar demobilization. The U.S. Army shrank to a garrison force occupying Germany and Japan, with only skeleton units at home. Given America's nuclear monopoly, few people outside the army saw any requirement for combat ready forces. Except for one division in Germany, the U.S. Army had no formations that even approched the 1946-47 tables of organization and equipment. All four divisions occupying Japan in 1950 had only two-thirds of their wartime authorization in men and equipment. Each of these divisions had only one tank company and one antiaircraft battery and was missing one out of every three infantry battalions and artillery batteries.[12]

The Korean Conflict

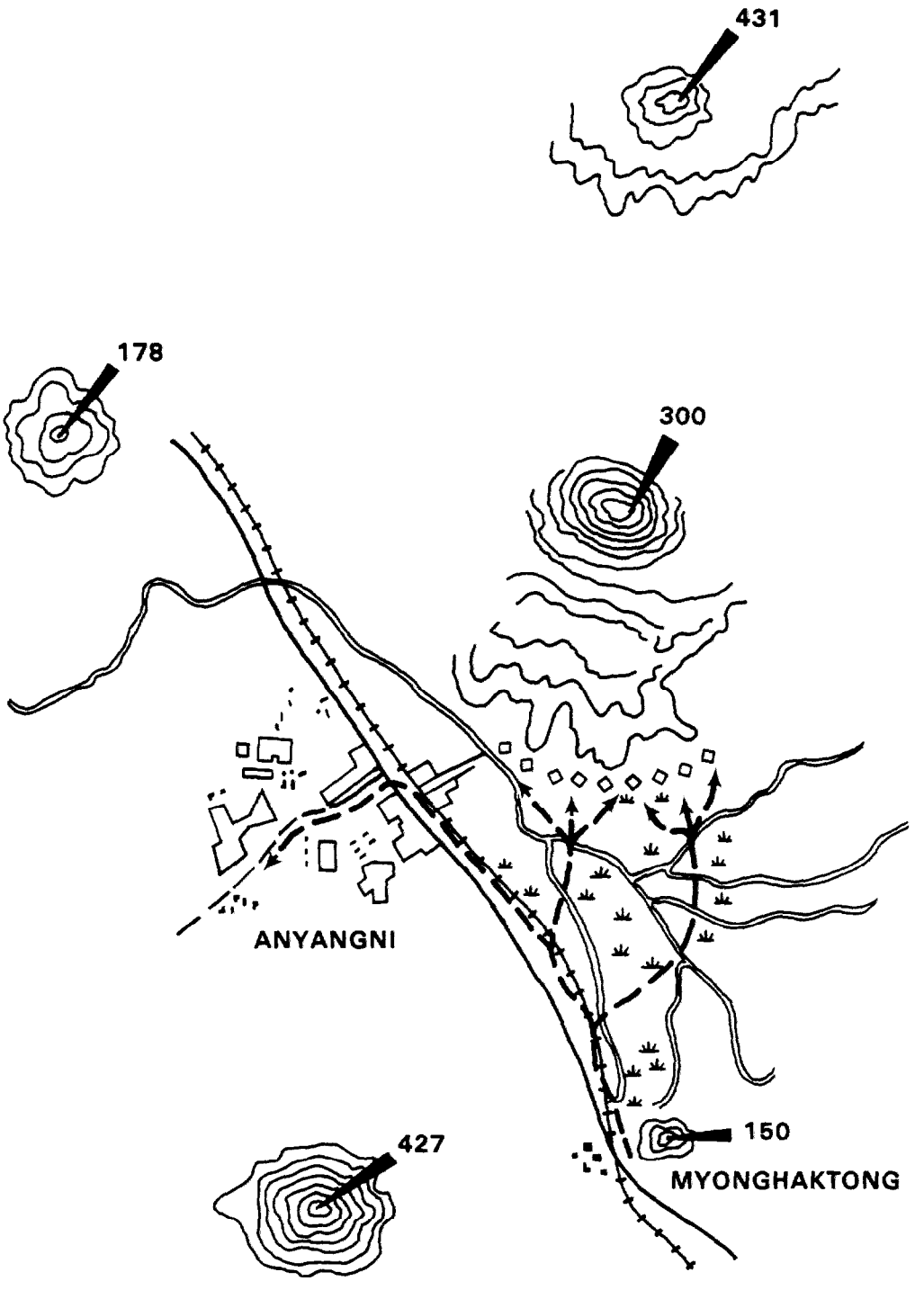
When the Soviet-equipped North Korean People's Army invaded South Korea in June 1950, the understrength American divisions in Japan entered combat in a matter of days. This sudden commitment to battle revealed more than a simple lack of combat power; it also demonstrated that the U.S. Army had a force structure that did not fit its doctrine. Regimental commanders were deprived of their primary antitank weapon, the tank, and had only the obsolete 2.36-inch rocket launcher for short-range antitank defense. With only two infantry battalions instead of three, a regiment had no reserve if it tried to defend on a normal frontage of two battalions. The shortage of manpower and the hilly terrain of the Korean peninsula increased the dispersion and isolation of defending units. Such dispersion allowed the North Koreans to practice tactics that were a combination of Japanese offensive operations in 1942 and the Soviet forward detachment. A small unit of Soviet-supplied T-34 medium tanks led each column as the North Koreans moved south. If this tank

force encountered a strongpoint that it could not overrun, light infantry forces bypassed that strongpoint through the surrounding hills, cut the defender's line of communications behind him, and forced the defender to withdraw or be cut off.[13]

Later in the war, the Americans, like the British a decade before them, learned to accept being cut off and under attack from flank and rear. Throughout the war, the most common American defensive position was a company entrenched for all-round defense of a ridge or hilltop, separated by hundreds or even thousands of meters from the units to its flanks. This type of dispersed, strongpoint deployment has become increasingly common in most armies since 1945, but it requires excellent fire support and, if possible, active patrolling to provide an effective defense. In the case of Korea, U.S. infantry frequently had to forego patrols and outposts, relying on superior firepower to defeat sudden enemy attacks delivered at close range. When such attacks occurred, a combination of artillery, heavy infantry weapons, and the organic weapons of the infantry proved effective in halting them.[14]

The initial contacts with the Chinese Communist Force (CCF) in October and November 1950 were not deliberate attacks or small-unit defenses, but rather a series of meeting engagements in which both sides were trying to use the same roads and streambeds as avenues of movement. By late 1950, the U.S. divisions had built up to their full tables of organization and were oriented on the few roads in an effort to occupy North Korea rapidly. Although much more lightly equipped, the CCF also used the low ground, moving southward in solid columns with security screens out and hiding in woods or villages when aerial reconnaissance searched the area. Once the initial surprise encounter was over, the CCF, many of whom were veterans of the guerrilla wars of China in the 1940s, shifted their attention to the high ground, moving around the U.S. and allied forces tied to the roads. American firepower soon made any daytime movement dangerous for the communists, and the establishment of company and battalion perimeter defenses on high ground further hampered the CCF movements. Thus, during the later years of the Korea conflict, the preferred CCF maneuver once again became the advance along the low ground at night, seeking to bypass enemy strongpoints in order to attack from unexpected directions.[15]

When the front began to stabilize in 1951, the Korean War became a war of attrition, with each side launching limited attacks to destroy enemy personnel. The U.S. used its World War II doctrine for combining the different arms in such attacks, modifying that doctrine slightly to maximize the available firepower and to minimize casualties. One small example of this operational technique was the second phase of Operation Punch, a



Map 8. Task Force Dolvin, Anyang-ni, Korea, 5 February 1951.

multi-battalion limited attack conducted by the 25th U.S. Infantry Division during early 1951 (Map 8). Two task forces advanced along parallel roads to reduce CCF resistance, withdrew at night to avoid infiltrations, and then returned to inflict additional casualties after the enemy had reoccupied his defenses. One of these two U.S elements was Task Force Dolvin, which consisted of a battalion headquarters and two companies of medium tanks, a battalion of infantry, a 4.2-inch mortar platoon from a regimental mortar company, a self-propelled antiaircraft machine gun platoon, a combat engineer platoon, and elements for communications, medical aid, and tactical air control. Because the intent was to clear enemy bunkers in the area of Hill 300, the infantry commander controlled the entire force. Communication between tank crews and the infantry riding on those tanks was difficult, because the newer M46 tanks, like the M4 tanks of 1944, had no external telephones mounted on them.

On 5 February 1951, the entire task force moved up the highway and deployed around the base of Hill 300. The self-propelled antiaircraft guns, with the enormous firepower of multiple heavy machine guns, deployed behind the tanks, with the two lines of vehicles staggered so that all could aim at the hill to engage the enemy defenses. For thirty minutes, the 4.2-inch and 81-mm mortars, the infantry recoilless rifles, the antiaircraft machine guns, and the tank weapons methodically blasted Hill 300, trying to suppress and if possible destroy enemy resistance. Then the infantry, which was sheltered behind the tanks during this preparatory fire, advanced up the hill. One man in each platoon deliberately exposed himself by wrapping a colored panel, originally intended for signalling aircraft, around his body. Whenever these leading men took cover because of enemy fire, all supporting weapons knew exactly where the friendly troops were, together with the approximate area of enemy resistance.[16]

In November 1951, the United Nations and its communist opponents tentatively agreed to a demarcation line for the armistice they were negotiating. Thereafter, the United States and its U.N. allies had little opportunity for maneuver attacks even as small as that of Operation Punch, because there was no object in clearing ground that would be lost at the armistice. Except for patrols, raids, and counterattacks in response to communist advances, the war became largely a matter of holding defensive positions.[17] Many observers compared this phase of the Korean War to the artillery and trench struggles of World War I, but in fact there were notable differences. Instead of a defense-in-depth along relatively narrow unit frontages, U.N. units in Korea formed a very thin line of strongpoints on high ground. Centralized fire control and artillery proximity fuzes

gave the U.N. defenders unprecedented firepower in the defense, while the attacking communists often had only limited fire support. In 1951, the U.S. Army further improved its fire direction capability by introducing rotating plotting boards, allowing an F.D.C. to adjust fire on a target without knowing the observer's location. Upon report of a communist attack, a horseshoe-shaped concentration of artillery and mortar fire, called a "flash fire," would descend around a U.N. outpost. This firepower isolated the area from further enemy reinforcement for hours and provided illumination to assist the defenders. Within the horseshoe of artillery shells, the defending infantry had to deal with the attackers who had closed on the strongpoint. A defending infantry company often had up to a dozen machine guns above its normal authorization and, in some cases, could call on self-propelled antiaircraft machine guns for ground fire support. On occasion, the artillery of an entire corps would fire in support of one such outpost. During a 24-hour period in April 1953, nine artillery battalions fired a total of 39,694 rounds to protect one infantry company.[18]

Artillery fire, even on such a lavish scale, could stop a determined enemy only while the shells were actually falling. By contrast, air support had a tremendous psychological effect on both sides in a ground action. Recognizing this, the U.S. Marine Corps in the Korean War maintained the tradition of intimate air-ground cooperation. This was especially important for the Marines, who had less nondivisional artillery and other fire support than the army. The U.S. Air Force preferred to concentrate on interdiction missions and established a cumbersome procedure for requesting close air support. In December 1951, the commander of the Eighth U.S. Army, Lt. Gen. James Van Fleet, expressed the dissatisfaction of his subordinate commanders on this issue. In a formal proposal to the U.N. commander, Gen. Mark Clark, Van Fleet requested that each of his four army corps receive an air force fighter-bomber squadron as a permanent attachment. This would ensure that the pilots were familiar with the units and terrain in a particular area and would respond rapidly when needed. General Clark studied the matter and finally rejected the proposal because it would divert scarce aircraft from other missions such as interdiction. He did, however, get both the Navy and Air Force to provide a much larger proportion of available aircraft for close air support, culminating in 4,500 sorties in October 1952. Gradually, the air and ground leaders became more familiar with each other's operations and capabilities. For example, the army learned that firing high explosive rounds with proximity fuzes just before an air strike would help protect the aircraft by suppressing enemy antiaircraft fire in the target area.[19]

One new area of air-ground operations in Korea was the use of helicopters. At the end of World War II, both the U.S. Marine Corps and the U.S. Army had purchased a few primitive helicopters

and studied their employment. The Marines organized an experimental helicopter squadron in 1947 and used those helicopters in small assault landings during amphibious exercises. Interservice agreements meant that the U.S. Air Force controlled design and procurement of helicopters for the army, significantly impeding development of this capability. Moreover, the U.S. Army stressed parachute and glider mobility at the expense of newer concepts. Still, by 1953 both the army and the marines had used helicopters not only for medical evacuation and liaison but also for limited movement of troops and supplies.[20]

In Search of a Mission: U.S. Army Organization From Triangle to ROAD

The genuine success of the U.S. Army in the Korean War caused a temporary increase in its size and budget. Armored forces especially profited from the example of North Korean tanks in 1950, and the army increased its armored strength from one combat command to four armored divisions between 1948 and 1956.[21]

At the same time, the Eisenhower administration chose to base its national strategy on "massive retaliation" with nuclear weapons. In order to justify its existence and mission, the U.S. Army had to develop a doctrine and organization that would allow ground forces to function effectively on a nuclear battlefield. Concentrated, fixed defenses of the type used in both world wars appeared to be vulnerable to nuclear attack, and so the army had to find a means of greater dispersion and flexibility, yet still retain efficient command and control. Unlike the Soviet Army, which had to fight only in the terrain of Europe and Asia--terrain favorable to mechanization--the U.S. Army had to remain relatively light in equipment, so that it would deploy rapidly to any trouble spot in the world.

These strategic considerations greatly influenced the tactical structure and concepts of the army. Tactical units had to be sufficiently small so that they would not present a lucrative nuclear target, sufficiently balanced between the arms so that they could defend themselves when isolated, and sufficiently self-supporting that they could fight without vulnerable logistical tails. Army commanders also wanted to streamline the command structure in order to speed the passage of information and decisions. The need for dispersion and for fewer command echelons prompted some theorists to consider increasing the span of control from three subordinate units to five. Five units, spread over a greater area, could report to one higher headquarters, thereby reducing the number of such headquarters needed at any level.

The result of all these concerns was the "Pentomic Division," a public relations term designed to combine the concept of five subordinate units ("penta") with the idea of a division that could function on an atomic or nonatomic battlefield. Five "battle groups" were at the core of the pentomic infantry division (Figure 16). Each battle group was an infantry formation that was smaller than a regiment but larger than the established triangular battalion. The authors of this design believed that they were eliminating the battalion level of the chain of command while retaining the reconnaissance, heavy weapons, and command and control elements of the triangular infantry regiment. In retrospect, however, a battle group appeared to be an oversized battalion, consisting of a headquarters and service company, four infantry companies of four rifle platoons and a heavy weapons platoon each, as well as a 4.2-inch mortar battery. Within the headquarters and service company, a variety of specialized units were available. The reconnaissance platoon, for example, integrated light tanks, an 81-mm mortar, and an armored infantry squad. The assault gun platoon, equipped with the unarmored, self-propelled M56 gun, provided both antitank and limited offensive gun support for the infantry. The infantry companies, which included the 81-mm mortars and 106-mm recoilless rifles previously located at battalion level, proved to be too large for effective control. In 1959 the battle group therefore acquired a fifth rifle company, but each company was reduced to only three rifle and one weapons platoon. Even the squad changed, increasing from nine to eleven men and officially acquiring a second automatic rifle. As a result, the pentomic infantry squad was able to practice the fireteam, fire and movement tactics used by all Marine Corps and some army squads during and after World War II.[22]

The pentomic division structure allowed the division commander to attach to each battle group, if necessary, one tank company, one engineer company, and one 105-mm howitzer battery. This fire support proved inadequate, and in 1959, the division's five direct-support batteries gave way to five composite direct-support battalions, each consisting of a 105-mm battery and a 155-mm battery. Such a composite battalion posed notable problems in training, ammunition supply, maintenance, and fire control of two dissimilar weapons. Because mortars had again proved unsuitable as an artillery weapon, the 1959 modifications also reduced the number of 4.2-inch mortars in a battle group and returned control of those mortars to the infantry.

Fire support was not the only difficulty with this organization. The division commander had only one brigade headquarters, commanded by the assistant division commander, to help control the five battle groups, the tank battalion, and the armored cavalry squadron. Even with a new division trains

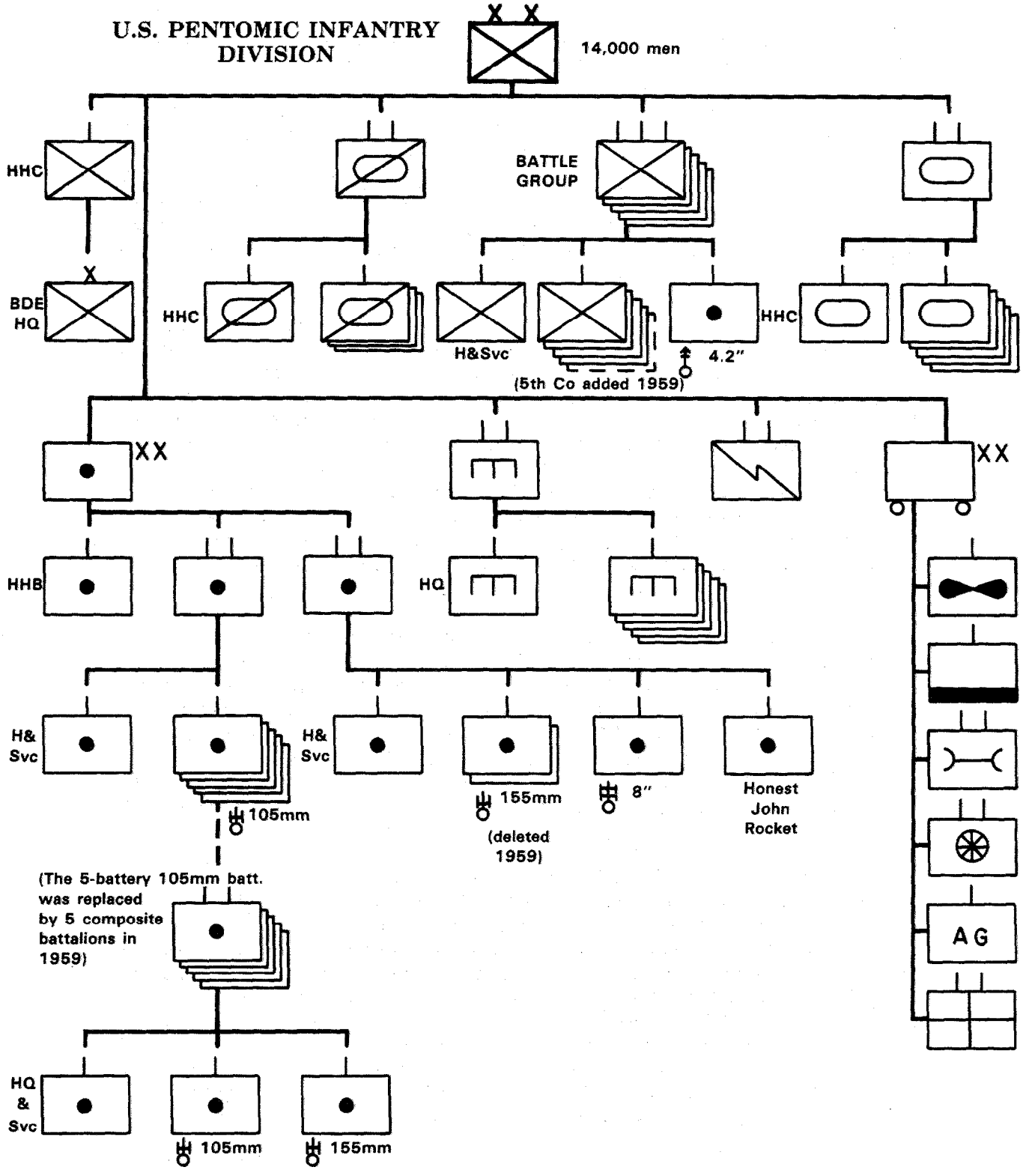


Figure 16. U.S. Pentomic Infantry Division.

headquarters to control logistical support, the division commander and headquarters risked being overwhelmed by the number of subordinate units involved. The growth of the signals element of the infantry division from a company to a battalion illustrated these command and control difficulties. Similar problems existed at the battle group level, where a colonel and his small staff had to control four or five rifle companies, a mortar battery, reconnaissance and assault gun platoons, a tank company, and direct-support artillery. By eliminating one level of headquarters, the pentomic infantry structure left all other headquarters with an excessive span of control. The loss of any one of those headquarters could be disastrous in battle.

Mobility was another problem. The pentomic structure included both a helicopter company and, for the first time, a large number of armored personnel carriers. These carriers, grouped in a transportation battalion, were able to move one battle group at a time. Because the carrier drivers belonged to one unit and the infantry to another, close cooperation between the two was difficult. Any battle group without these armored carriers had only limited protection and mobility. In addition, many senior commanders anticipated that their divisions would be deployed for nonatomic struggles in various areas of the world. Such a deployment could well mean leaving the tank battalion and other heavy equipment behind.

The effects of the Pentomic concept on the rest of the U.S. Army were much less drastic. The armored division retained its three combat commands, four tank battalions, and four armored infantry battalions. It acquired an aviation company to centralize existing aviation assets and received the same general support artillery battalion (155-mm/8-inch/Honest John rocket) as the infantry division, instead of the previous 155-mm battalion. As in the infantry division, the armored signal company grew to a battalion.

The pentomic changes also brought the nondivisional armored cavalry regiment, the descendent of the World War II cavalry reconnaissance group, to the structure it retained into the 1970s. Each of three reconnaissance squadrons in this regiment received enough logistical support elements to enable it to operate semi-independently. Such a squadron consisted of a headquarters and headquarters troop, three armored reconnaissance troops, a tank company, and a self-propelled howitzer battery. A reconnaissance troop represented an ideal of combined arms organization, because each of its three platoons integrated tanks, infantry, scouts, and a mortar.[23]

This organization of cavalry reconnaissance organizations served two purposes. First, the variety of main battle vehicles in such units made it difficult for an opposing force to distinguish between U.S. cavalry and other combined arms forces and, therefore, to determine whether the U.S. force in question was simply a cavalry screen or a major force. Second, this combination of weapons and vehicles allowed U.S. reconnaissance forces to fight, if necessary, to develop intelligence about the enemy. As the Soviets had discovered in 1944, a reconnaissance force that is not able to fight in this way will be much less effective even in its primary role of intelligence collection and screening.

By 1959, the U.S. Army had a radically new structure and operational concept to meet the changing demands of nuclear warfare. This structure and concept differed markedly from the armor-heavy solution of the post-Stalin Soviet Army, but the American commanders were no happier with the results than were their Soviet counterparts.

During the same time period, the possibility of nonnuclear conflict increased. The Kennedy administration came into office in 1961 committed to the concept of flexible response. Despite the army's original purpose, the pentomic division was heavily oriented for nuclear warfare. Thus, the army needed new structures to fight across the entire spectrum of possible conflicts from "low intensity" terrorism and guerrilla wars up to fully mechanized and even nuclear warfare. The new administration quickly approved ongoing army studies for a different division organization, the Reorganization Objectives Army Division (ROAD) (Figure 17). The different types of ROAD division shared a common division base, including a cavalry reconnaissance squadron of some type, three brigade headquarters, division artillery, division support command, engineer battalion, and eventually an air defense battalion. The brigade headquarters, like the combat commands of the World War II armored division, could control a varying number of combat and combat support elements. The combat arms battalion replaced the battle group as the largest fixed-maneuver organization, but retained many of the battle group's elements, including reconnaissance, mortar, and service support units.

The unique aspect of the ROAD division was the ability to "task organize" and tailor structures at any level. Strategically, the army could choose to form and deploy armored, mechanized, conventional infantry, airborne, and later airmobile divisions, depending upon the expected threat. Although there were recommended configurations of each division type, in practice planners could further tailor these different division types by assigning various numbers and mixes of armored,

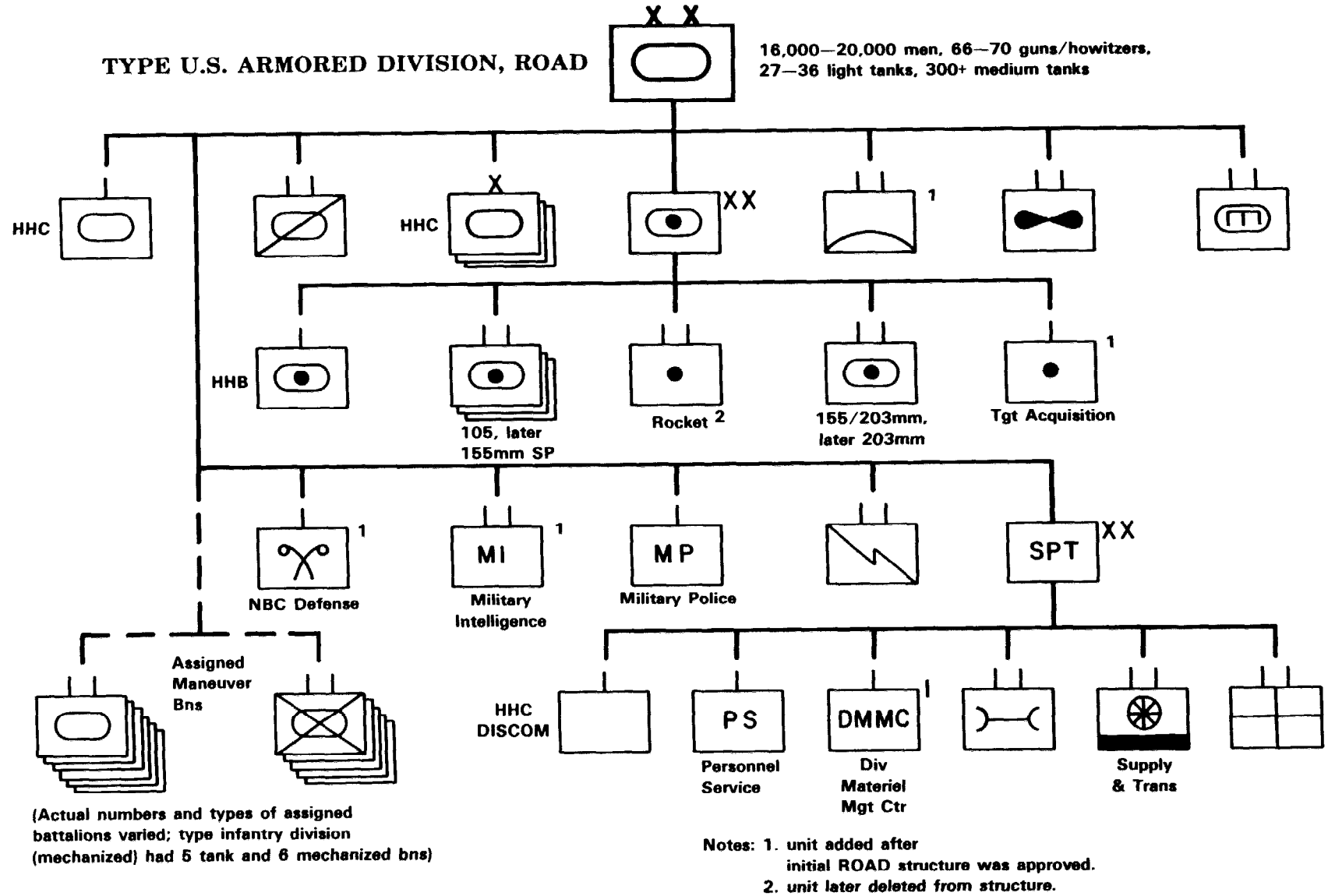


Figure 17. Type U.S. Armored Division, ROAD, 1965—1983.

mechanized infantry, infantry, airborne infantry, and airmobile infantry battalions, for a total of anywhere from seven to fifteen maneuver battalions. The division commander and staff had considerable flexibility in attaching these battalions to the three brigade headquarters. Finally, within the brigades and battalions, commanders could task organize combined arms forces by temporarily cross-attaching infantry, mechanized, and armored companies and platoons, as well as attaching engineers, air defense artillery, and other elements. Thus a battalion task force or company team might receive a variety of subordinate units of different arms, allowing integration of the arms as the mission required. In practice, of course, such tailoring and task organizing were prey to the same problems that the World War II system of pooling and attachment had suffered. Constantly shifting units resulted in inefficiency and poor coordination between subordinate elements that were unfamiliar with each other. As a result, battalion and brigade commanders tried to keep the same elements "habitually associated" with each other unless a radical change of mission or terrain occurred. Nevertheless, the ROAD structure gave the U.S. Army the span of control and flexibility of organization it had lacked under the pentomic structure.[24]

Air Assault

The Kennedy administration's dedication to flexible response also brought the long-standing question of helicopter mobility to resolution. The result was a noteworthy new capability in air-ground interaction and in tactical operations in general.

During the later 1950s, the USMC continued to lead the other services in the application of helicopters for battalion and larger unit assaults. While the army struggled with the pentomic structure, the marines reconfigured their divisions and regiments to eliminate much heavy equipment, relying on mortars, naval gunfire, and aircraft rather than on howitzers for direct-support artillery. The assault elements of a marine division became completely air transportable as a result.[25] The more limited army experiments focused on helicopters in a cavalry role, with small aviation units for screening, raids, and reconnaissance. Brig. Gen. Carl I. Hutton, commandant of the U.S. Army Aviation School during the period 1954-57, conducted extensive experiments to improvise gun and rocket armament for helicopters and then to use armed helicopters tactically. The U.S. Army Infantry School made similar efforts, and the Director of Army Aviation, Maj. Gen. Hamilton H. Howze, attempted to popularize the concept of completely heliborne units. The U.S. Air Force adamantly opposed any expanded role for army aviation as a challenge to air force missions, and thus only limited progress was possible during the 1950s.[26]

Then in 1962, following the suggestions of several army aviation advocates, Secretary of Defense Robert McNamara asked the U.S. Army to study the bold use of aviation to improve tactical mobility for ground forces. The result was the Howze Board of 1962. General Howze and his staff conducted tests on everything from dispersed fuel stockpiles for helicopters to close air support bombing by army fixed-wing aircraft. Howze recommended the formation of a number of air assault divisions depending almost entirely on army aircraft, as well as separate air cavalry brigades for screening and delay roles and air transport brigades to improve the mobility of conventional divisions. He noted that an air assault division could maneuver freely to attack a conventional foe from multiple directions and could use both artificial and natural obstacles to delay or immobilize an enemy while itself remaining free to fly over those obstacles.[27]

After a considerable internal struggle, the Defense Department authorized the creation of a division for further testing. From 1963 to 1965, the 11th Air Assault Division (Test) at Fort Benning acted as the vehicle for extensive tactical training and experimentation. The 11th itself was so small that it often had to borrow elements of another division to conduct exercises. When the division first formed, army regulations still forbade army aircraft to fly in formation, and thus many techniques had to be developed with little or no background experience. In order to make the division's supply system as mobile as its maneuver elements, the division commander, Maj. Gen. Harry Kinnard, developed refueling and rearming points camouflaged and dispersed near the battle area. Artillery, aviation, and infantry had to cooperate closely to suppress enemy resistance during an assault landing. Artillery and available air force aircraft fired on the proposed landing zone (LZ) until assault aircraft began their final approach, one or two minutes prior to landing. The last artillery rounds were smoke, to signal helicopter gunships to take up direct-fire suppression around the LZ while troop helicopters landed and discharged their infantry. Early helicopter weapons were rather inaccurate, but their fire had a considerable psychological effect on both friend and foe. Artillery and infantry changed location frequently by helicopter and often conducted false, temporary landings in multiple locations to confuse the enemy as to their actual dispositions and intentions.

The division's air cavalry squadron combined elements for aerial observation, insertion and recovery of ground reconnaissance teams, and armed helicopter "gunships" within each air cavalry troop. The air cavalry conducted the traditional cavalry missions of reconnaissance, screening, and raids almost entirely from the air. After a number of tests, the air assault

division had clearly demonstrated its potential. The two most obvious vulnerabilities of such a unit were the loss of mobility and resupply capability in darkness or extremely poor weather, and the debatable effects of enemy air defense on helicopter tactics.[28]

During the same period, U.S. Army helicopter units, both armed and unarmed, supported the Army of the Republic of Vietnam (ARVN). This provided a combat test for the concepts developed by Howze, Kinnard, and others, and personnel and ideas passed frequently between Vietnam and the 11th Air Assault Division at Fort Benning. Initially, American helicopters in Vietnam did little more than transport troops from one place to another. By 1964 American helicopter gunships and transports formed small air assault units with Vietnamese infantry on a semi-permanent basis.[29]

Inevitably, the U.S. Air Force protested the U.S. Army's use of armed helicopters and even armed fixed-wing aircraft in a close air support role in Vietnam. The government of South Vietnam was so concerned about possible disloyalty in its own forces that it further complicated the already cumbersome process of requesting air support from Vietnamese Air Force elements. Despite USAF protests, American and Vietnamese ground commanders felt compelled to use any air support that was available, including army aviation when air force channels proved unresponsive. By 1967, the U.S. involvement had reversed the situation, providing large amounts of air force close support for ground forces in most circumstances. Because there was no enemy air threat over South Vietnam, the USAF supported the ground forces to such an extent that Congress held hearings about the neglect of the air superiority mission. This artificially high level of air-ground cooperation temporarily buried much of the rivalry between the U.S. Army and U.S. Air Force.[30] However, no air force would have been able to provide such sustained support to ground forces while simultaneously struggling for air superiority against a comparably equipped enemy air force.

In the interim, the U.S. Army fully integrated the helicopter and its tactics. In the summer of 1965, the 11th Air Assault Division became the 1st Cavalry Division (Airmobile) and deployed to Vietnam (see Figure 17). General Howze's plan to use fixed-wing army aircraft in a ground-attack role had failed, but many of his other recommendations were reflected in the new airmobile division. An aerial artillery battalion armed with rocket-firing helicopters replaced the general support artillery battalion found in other ROAD division structures. A division aviation group, including two light and three medium helicopter battalions and a general support aviation company, could redeploy several infantry battalions simultaneously.

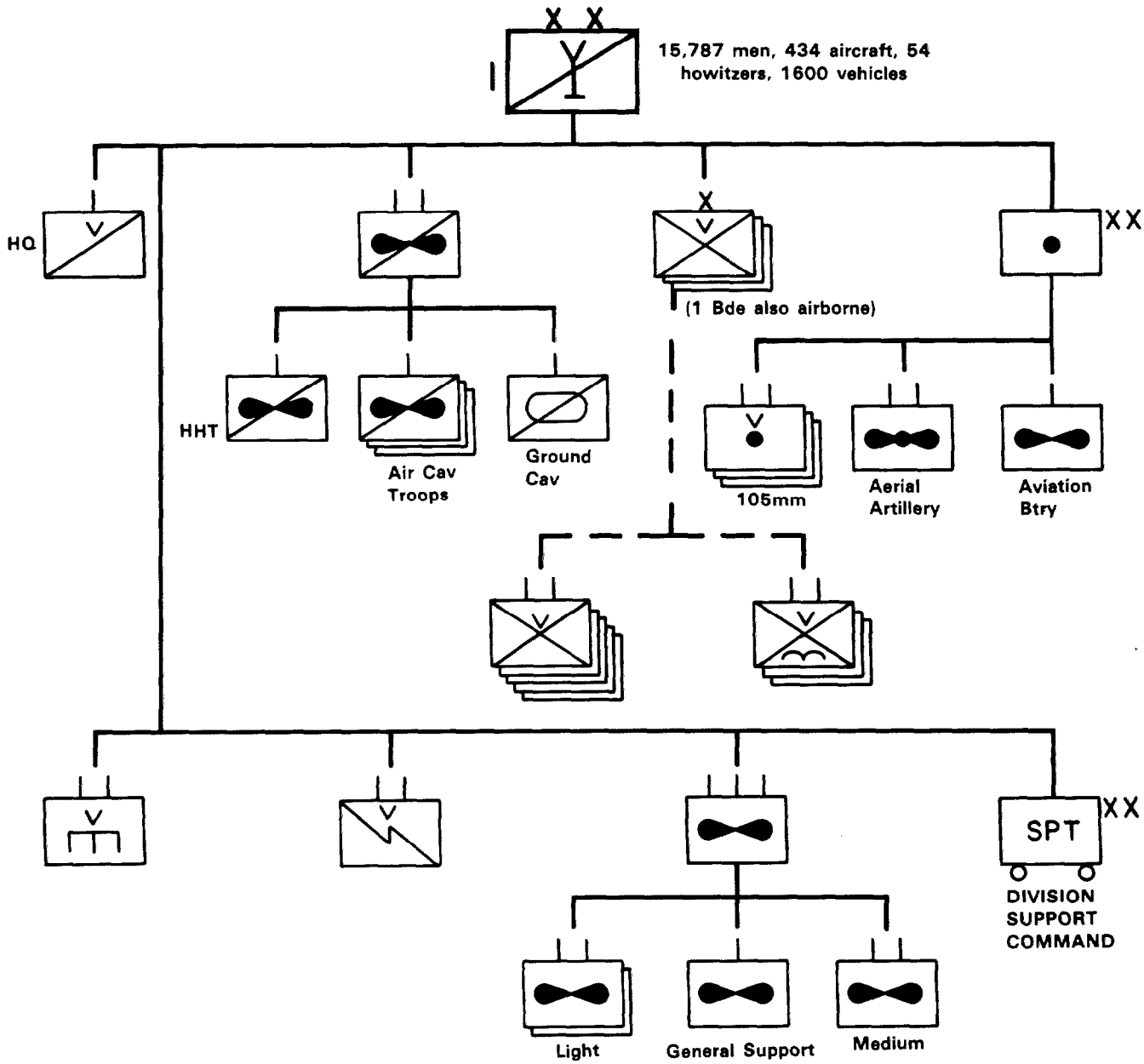


Figure 18. 1st Cavalry Division (Airmobile), 1965.

Entering combat in the fall of 1965, the 1st Cavalry much more often found itself fighting North Vietnamese conventional light infantry regiments than small guerrilla bands. On 14 November 1965, for example, a battalion landed by helicopter in the base camp of the North Vietnamese 66th Regiment, forcing the enemy to turn and fight in his own rear area. Superior mobility and firepower of this type temporarily halted a North Vietnamese invasion of the south.[31]

One key to the airmobile or air assault concept was the close integration, within the same unit, of helicopter and ground forces. By contrast, using helicopter gunships and transports from one major unit to airlift infantry or artillery elements of another unit was much less efficient, requiring more time and effort to ensure coordination and mutual understanding between the parties involved. In practice, the U.S. Army lacked sufficient helicopter assets to make all the American, Korean, and Vietnamese units fully airmobile with their own organic aviation. Instead, the 1st Aviation Brigade controlled up to 100 company-sized aviation units of various types. Battalions from this brigade were habitually associated with different divisions. Even the two airmobile divisions, the 1st Cavalry and 101st Airborne, frequently had to lend their assets to support neighboring units.[32]

Airmobility did more than put the enemy off balance and neutralize conventional obstacles. It also forced the U.S. Army to change many procedures to accomodate operations over a large territory without a defined "front line." For example, both field artillery and signal units ordinarily oriented their support towards a particular front line or axis of advance. By contrast, in Vietnam these branches had to operate on an area concept, providing fires and communications in any direction from a pattern of small bases. Even this system did not always give sufficient artillery support for a large-area operation, and thus the 1st Cavalry Division controlled a nondivisional 155-mm artillery battalion that could be lifted by heavy transport helicopters.[33]

Lam Son 719

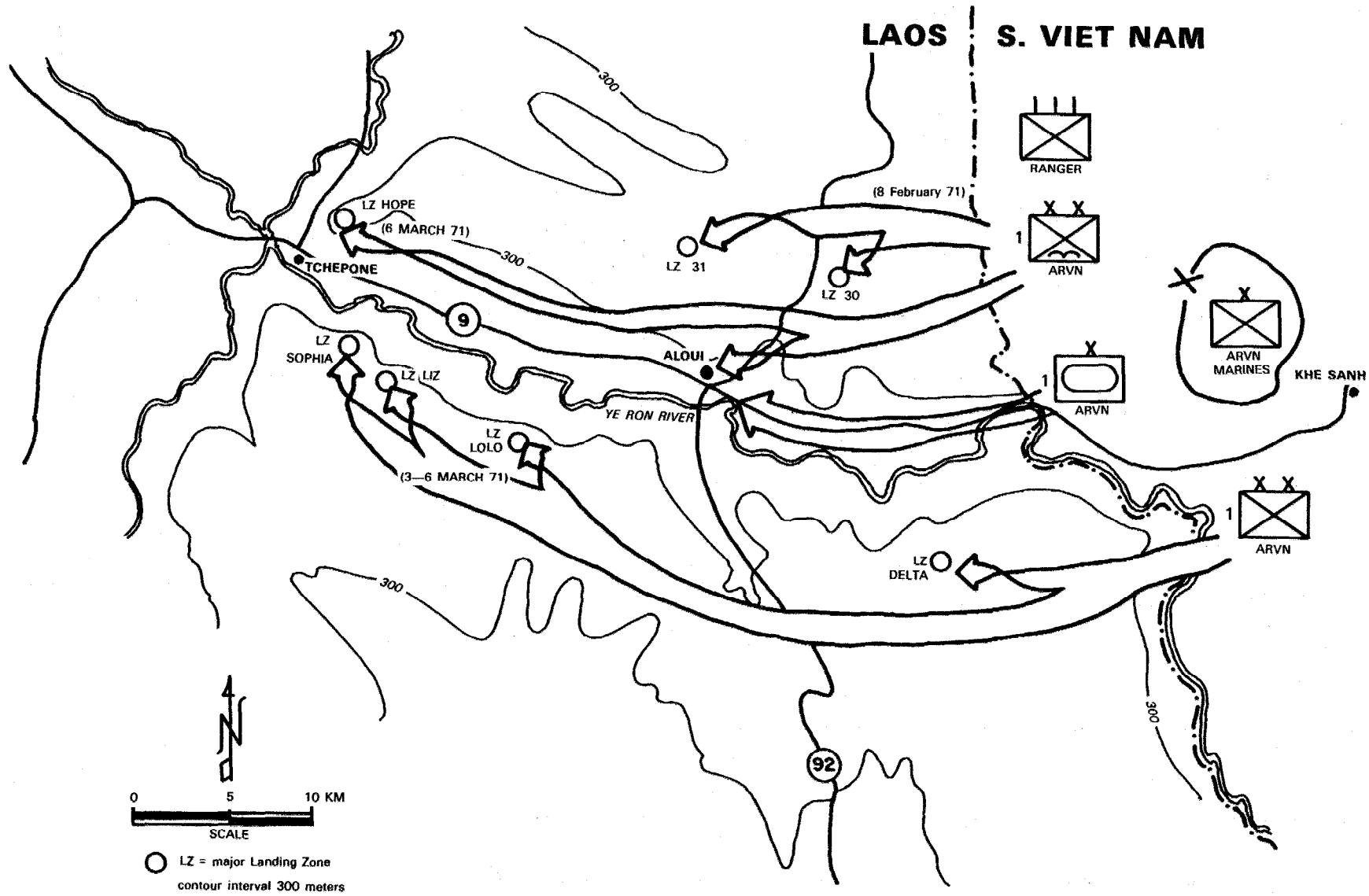
When the 1st Cavalry Division deployed to Viet Nam in 1965, it used the tactic of terrain flying--hugging the ground with helicopters--to present a fleeting target for ground air defense. This procedure worked well in jungle and rough terrain, but in more open areas the enemy on the ground had more time to react and to fire on helicopters. Because the principal air-defense threat was small arms and automatic weapons fire at

low altitudes, at least some aviation units began to fly above the effective range of such weapons. Many observers argued that such high altitude, level flight would be suicidal against an enemy with larger and more sophisticated air defense weapons. One battle in 1971, known as Lam Son 719, became the center of the debate on the vulnerability of helicopters in combat.[34]

The purpose of Lam Son 719 (Map 9) was to destroy the North Vietnamese base area in Laos, specifically the large logistical installations around Tchepone. This would forestall a major North Vietnamese offensive to take control of the northern provinces of the Republic of Vietnam. I ARVN Corps planned to make the main effort with the 1st ARVN Airborne Division conducting airmobile operations north of the Ye Pon River, while the 1st Armored Brigade, which was attached to the airborne division, advanced westward along Route 9 into Laos. The 1st ARVN Infantry Division would conduct a secondary attack south of the Ye Pon River, providing fire support and flank protection for the main attack. Finally, a three-battalion force of Vietnamese rangers was responsible for the northern (right) flank of the 1st Airborne Division.

This plan had problems even before the offensive began. First, the U.S. government would not permit U.S. forces to operate on the ground inside Laos, and thus the ARVN units had to fight for the first time without their American advisors. Although most ARVN units were capable of such operations, the absence of advisors made coordination of air support and airmobile transport much more difficult. On the other hand, the ARVN units depended upon American helicopters and air support for their mobility and firepower. U.S. Army aviation and ARVN ground unit commanders had to plan each operation as equals, which inevitably slowed down the planning process even though both sides tried to cooperate.

Terrain was another major handicap. The Ye Pon River valley, including Route 9 that paralleled the river, was the natural avenue of approach between Viet Nam and Tchepone. This valley was so narrow that the 1st ARVN Armored Brigade lacked maneuver space for its three armored cavalry squadrons. The valley was also a natural air corridor, especially when clouds reduced visibility over the high ground on either side of the valley. The Ye Pon River was the most prominent terrain feature for helicopter navigation. As a result, much air traffic was channeled down the valley, and once the ARVN forces began their advance, their future axis of attack was immediately obvious to the defending North Vietnamese. Huge ARVN convoys near the border gave the North Vietnamese ample warning of the projected attack.


LAOS
S. VIET NAM
RANGER
(8 February 71)
LZ HOPE
(6 MARCH 71)
TCHEPONE
300
LZ 31
LZ 30
1
ARVN
9
LZ
SOPHIA
LZ LIZ
ALOUI
ARVN
MARINES
KHE SANH
YE RON RIVER
LZ
LOLO
(3—6 MARCH 71)
1
ARVN
LZ
DELTA
300
92
300
N
0
5
10 KM
SCALE
LZ = major Landing Zone
contour interval 300 meters

For several years prior to Lam Son 719, the communists had established an integrated air defense oriented on the valley and on the few natural helicopter LZs. Nineteen antiaircraft artillery battalions were in the area, including 23-mm, 37-mm, 57-mm, and 100-mm antiaircraft guns, and 12.7-mm machine guns. The antiaircraft coverage was thickest around the Tchepone supply dumps. In addition, the North Vietnamese had preplanned artillery fires on all likely LZs. The North Vietnamese reinforced their defenses during the battle, reaching a total of twelve infantry regiments, two tank battalions, and considerable artillery support.[35]

The result was a "mid-intensity war" rather than a counterinsurgency operation. The ARVN began its attack on 8 February 1971, but had to delay operations the next day because of poor weather. Throughout the offensive, air force air support was often unavailable because of low cloud cover. Even single helicopters on medical evacuation or supply flights needed armed helicopter support to suppress enemy air defense. This in turn strained the available resources of AH-1 attack helicopters and forced the U.S. Army to use the slower, more vulnerable, and generally obsolete UH-1C gunships.

The helicopters engaged North Vietnamese light tanks, destroying six and immobilizing eight. At the same time, T-34 medium tanks overran the ARVN firebase at LZ 31 after repeated attacks. Because the U.S. and ARVN forces had rarely needed large-caliber antitank weapons before this battle, they had few effective defenses available. The U.S. Army aviation commander for Lam Son 719 urged the army to renew its study of antitank helicopters.[36]

After several weeks of limited success, the ARVN commander abandoned plans for a ground advance west of Aloui. Instead, during the first week of March 1971, the 1st ARVN Infantry Division established a series of temporary firebases on the escarpment along the southern side of the river. On 6 March, two battalions of the 1st ARVN Airborne Division air assaulted into LZ Hope. This LZ was in the center of the enemy air defense umbrella, but the two battalions lost only one helicopter out of 120 in the attack. These later air assaults were carefully planned and supported operations. Strategic and tactical bombers suppressed local enemy defenses and often created clearings to be used as new, unexpected LZs. Gunships and air-delivered smoke screens protected the infantry during their landings.

The ARVN accomplished its mission, destroying the support facilities around Tchepone before withdrawing with considerable losses. This operation delayed a major North Vietnamese offensive for a year, but the cost seemed excessive. In addition

to several infantry battalions virtually destroyed, the U.S.-ARVN attackers lost a total of 107 helicopters shot down in six weeks. Many observers cited Lam Son 719 as proof that airmobile operations were too vulnerable to enemy air defense and could not be conducted in complex, mechanized wars.

Yet these helicopter losses must be evaluated carefully. One hundred and seven helicopters represented perhaps ten percent of the number of U.S. Army aircraft involved at any one time, but only a small loss in an offensive during which the U.S. Army flew more than 100,000 sorties. This was true even though many of these sorties were only short "hops." The terrain neutralized most of the advantages of an air assault force, allowing the defender to focus his attention on a few critical areas through which the advance and withdrawal had to pass. This concentration of antiaircraft fires, in combination with poor weather, forced the helicopters to avoid terrain flying by increasing their altitude to about 4,000 feet above ground level. Finally, since 1971, helicopters have acquired improved navigation devices and more survivable mechanical designs. Similar circumstances of weather and terrain might still hamper air assault operations, but Lam Son 719 by itself did not definitely prove such operations to be impossible.[37] Certainly the other NATO powers and the Soviet Union used the airmobile experience of Vietnam to help in the development of their own army aviation doctrine.

The Nato Powers

For fifteen years after 1945, the military policies and posture of Western European powers resembled those during the same period after 1918. The war had exhausted the Europeans, who were reluctant to finance major new weapons systems for their armed forces. The Allies allowed West Germany to rearm only after a decade of occupation, and even then only because of the conflict between East and West. The new Bundeswehr could not afford to mechanize all its formations in accordance with the experience of World War II, and so the first-line units had different equipment and tactics from the other German ground forces. France and Britain had even greater problems, developing three elements within their armies: a fully mechanized force committed to defense of central Europe, a less-equipped conscript and reserve force at home, and a lightly equipped but well-trained and strategically mobile element for conflicts outside of Europe. Such conflicts and the demands of strategic mobility encouraged British and French interest in light tanks and armored cars that might be used both at home and abroad.

In the 1960s, the end of conscription in Britain and the gradual termination of counterinsurgency wars abroad caused both the British and French armies to reorient on defense in Europe.

Even then, democracies were naturally suspicious of "offensive" weapons such as tanks, preferring to develop "defensive" weapons such as the antitank guided missile (ATGM). The French SS-11 was the first effective ATGM in NATO, and many nations including the United States adopted it during the early 1960s.

Britain, France, and West Germany all accepted the concept of combined arms or "all-arms cooperation" as a principle of tactics. This similarity of concept was reflected by some similarity in large-unit organization. All three armies converged on fixed combined arms forces that in U.S. terms are of brigade rather than divisional size. By contrast, within the U.S. ROAD division, brigades might change their configuration to adjust to different situations and missions. The evolution of the fixed European brigade may be a result of orientation on the single mission of mechanized operations in Europe. In any event, this evolution deserves a brief review.

At the end of World War II, the British Army retained its two-brigade armored division and three-brigade infantry division with only minor changes. The mixture of three tank and one motor battalion in an armored brigade, and three infantry and one tank battalion in an infantry brigade, allowed for cross-attachment at battalion and company level. The resulting combinations would be in the proportion of three companies or platoons of one arm with one of another. During the 1950s, the British Army of the Rhine (BAOR) developed a "square brigade" structure that was more suitable for a variety of tactical situations. Each brigade then consisted of two tank and two mechanized infantry battalions. These brigades came to have a fixed organization of other arms, generally including a 105-mm artillery battalion, two engineer companies, and more service support than any other NATO brigade. Although these units might nominally belong to the division as a whole, they were habitually assigned to specific brigades. Thus, the two levels of command, division and brigade, became redundant. Many brigade headquarters disappeared or became "field forces" in 1977-78. This, plus the needs of economy, prompted the BAOR to reduce the division to only six maneuver battalions--three tank and three mechanized infantry--in 1982. Pairs of tank and mechanized infantry battalions still carried the designation of "brigade," and might control a semi-permanent combination of artillery, engineers, and other arms. This structure bore a considerable resemblance to the 1943 U.S. armored division. Outside of the BAOR, the brigade level of command was more important. Although designated divisions existed in the United Kingdom, the deployable unit was usually the infantry brigade, consisting of approximately five infantry battalions plus other arms.[38]

As late as 1954, the French Army, whose Free French divisions had been equipped by the U.S. during World War II, retained the equipment and organization of the U.S. armored division. After the Algerian War ended in 1961, the French Army renewed its study of mechanized operations and organizations, culminating in the Type-67 (1967) mechanized division consisting of three mechanized brigades. Each of these brigades, like their German and British counterparts, had a permanent structure. The brigade included one main battle tank battalion, two mixed mechanized battalions, a self-propelled artillery battalion, and an engineer company. As in the case of Britain, this structure for European operations was so fixed that the brigade and division levels of command were somewhat redundant. As a result, in the mid-1970s, the French Army began to convert all of its units to a new structure, labeled a division, that was in fact an oversized brigade. The armored division, for example, consisted of only 8,200 men, organized into two tank, two mechanized, one artillery, one engineer, and one headquarters and service battalion. The infantry division within France became even smaller, totaling 6,500 men in three motorized infantry and one armored car battalion, plus other arms as in the armored division. The French hoped that this smaller division structure would be more responsive and fast-moving on the nuclear battlefield. For the French Army, the function of armored divisions in such a battle was to cause the enemy forces to mass and present a vulnerable target for French tactical nuclear weapons.[39]

One of the unique aspects of French Army structure during the 1960s and 1970s was the organic combination of different arms within one battalion. The French began experiments with combined arms battalions in the early 1960s, culminating in the mixed or "tank-infantry" battalion of 1967. Within this battalion, two light tank companies each consisted of four tank platoons plus an antitank guided missile platoon, while two mechanized infantry companies had three mechanized platoons each. The two types of companies cross-attached platoons for tactical operations. The battalion headquarters controlled other arms, including communications, reconnaissance, and mortar platoons. Use of the same basic vehicle chassis simplified the maintenance problems of each battalion and ensured that all elements had uniform mobility. First the AMX-13 and later the AMX-10 family of armored vehicles included compatible vehicles for light armor, ATGM launchers, and infantry. The French had to extend greatly the amount of training given to junior leaders to enable them to control three types of platoons. This problem helped force the French Army to reduce the size of both tank and mechanized infantry platoons to three vehicles each, a unit easier to supervise and control. Finally, because these tank-infantry battalions could no longer provide infantry support for pure tank units, the medium or main battle tank battalion in each

mechanized brigade acquired an organic mechanized infantry company. In practice, this tank battalion often had to support the tank-infantry battalions because of their limited armor protection against massed enemy attack.[40]

While France led the western powers in the integration of different arms within the infantry battalion, West Germany led in the development of mounted infantry integrated with armor. Based on the experience of World War II panzer-grenadiers, the postwar German commanders were determined to provide effective armored fighting vehicles for their infantry. The resulting Marder was the first mechanized infantry combat vehicle (MICV) in NATO. The Marder had a turret-mounted automatic cannon, NBC protective system, and gunports for infantry weapons. German commanders intended the mechanized infantry to fight from their MICVs, dismounting only when necessary for special operations such as patrols or urban combat. The German panzer-grenadiers had the smallest dismounted squad size--seven men--of any western army. The Marder itself became the base of fire around which the dismounted squad maneuvered as the assault team.

The German concept and design for a MICV drew considerable attention and imitation both in the Soviet Union and in the other members of NATO. Yet, if tanks and mounted infantry operated as a team under all circumstances, the MICV required the same mobility and protection as a tank, becoming in essence another tank. The British Army had recognized this at the end of World War II, when it had used a limited number of Sherman tank chassis without turrets as "Kangaroo" heavy personnel carriers. The Marder itself went a long way in the same direction, but its weight of 27.5 tons made crossing obstacles difficult, and its production cost prevented the Bundeswehr from equipping all German infantry with this vehicle.[41]

The Germans were also the only power to field new armored tank destroyers during the 1960s, although a decade later the Bundeswehr replaced those tank destroyers with tanks. The Jagdpanzer was organic to German brigades and sometimes carried ATGMs as well as a 90-mm high-velocity gun. A gun-equipped antitank vehicle of this type seemed too specialized to maintain in peacetime, especially when ATGMs were so much more effective and flexible. In the later 1970s, however, new forms of ceramic and other specialized armor protection greatly reduced the effectiveness of the shaped-charge chemical energy warheads used on most ATGMs and low-velocity guns. The shaped-charge round was not totally useless, because no nation could afford to use ceramic armor on all its combat vehicles, or even on all surfaces of main battle tanks. Still, the tank or a high-velocity gun on a tank surrogate was again the most effective weapon against enemy tanks, and infantry units were potentially more vulnerable

to armored attack than they had been since 1943. Both high-and low-velocity antitank weapons can neutralize the armor of existing MICVs, but nothing the mechanized infantryman has can effectively neutralize ceramic-armored tanks. Further weapons development must occur before the low-velocity, man-portable antitank weapons that were so popular in the 1970s can again compete on an equal basis with tank or tank destroyer high-velocity guns.

From Home Defense to Blitzkrieg: The Israeli Army to 1967

In four wars and numerous undeclared conflicts since 1948, Israel has become famous as an expert practitioner of highly mechanized combined arms warfare. Yet to understand the strengths and weaknesses of the Israeli Defense Forces we must remember the origins of those forces.

In 1948, the Israeli portions of Palestine declared independence from Great Britain while under attack by their Arab neighbors. At the time, the Israeli armed forces were a loose confederation of self-defense militia, anti-British terrorists, and recent immigrants. A number of Israelis had training as small-unit leaders, both in the local defense forces and in the British Army of World War II. What Israel lacked were commanders and staff officers with experience or formal training in battalion or larger unit operations. Even after independence, Great Britain would allow only a few Israelis to attend British military schools. Moreover, until the 1960s Israel could find neither the funds nor the foreign suppliers to purchase large quantities of modern weapons.

As a result, the Israeli Army of 1948-56 was an amateur army, poorly trained and equipped. It relied on its strengths in small-unit leadership and individual initiative, strengths that were sufficient for self-defense until the Soviet Union began to supply Egypt with large quantities of modern heavy weapons. The honored elite of this light infantry army were the paratroopers of 202d Brigade, who conducted raids into Arab territory. Indeed, throughout its history Israel has always assigned the cream of its army recruits to the airborne brigades.

Moshe Dayan became Chief of Staff of this unusual army in 1953. In 1939, Dayan had been one of a number of Jewish self-defense soldiers who received unauthorized small-unit training from Capt. Orde Wingate, the erratic British genius who later founded long-range British attacks in the jungles of Burma. During the 1948 War of Independence, Dayan commanded the 89th Mechanized Commando Battalion, a ragged collection of half-tracks and light vehicles that conducted daring raids into Arab rear areas. While visiting the United States, Dayan by

chance met Abraham Baum, the famous World War II tank company commander who had led a small raiding party behind German lines to release American prisoners of war at Hammelburg, Germany. Baum's account of American armored tactics in World War II reinforced Dayan in his belief in speed, mobility, and commanders going forward to make decisions on the spot. Thus, Dayan discovered that his own ideas were in part a reinvention of the principles used by both Americans and Germans in World War II.[42]

Dayan's genius in the 1956 war lay in his recognition of Arab vulnerability to rapid attacks:

> The Egyptians are what I would call schematic in their operations, and their headquarters are in the rear, far from the front. Any change in the disposition of their units, such as forming a new defense line, switching targets of attack, moving forces not in accordance with the original plan, takes them time--time to think, time to receive reports through all the channels of command, time to secure a decision after due consideration from supreme headquarters, time for the orders then to filter down from the rear to the fighting fronts.
>
> We on the other hand are used to acting with greater flexibility and less military routine . . .[43]

The Egyptian defenders of the Sinai desert in 1956 occupied a string of positions at key terrain points lacking both depth and flank security. These defenses were vulnerable to outflanking Israeli movements and lacked a large counterattack force to support them. Dayan planned to disorganize and ultimately collapse the defense by rapid thrusts at Egyptian lines of communication.

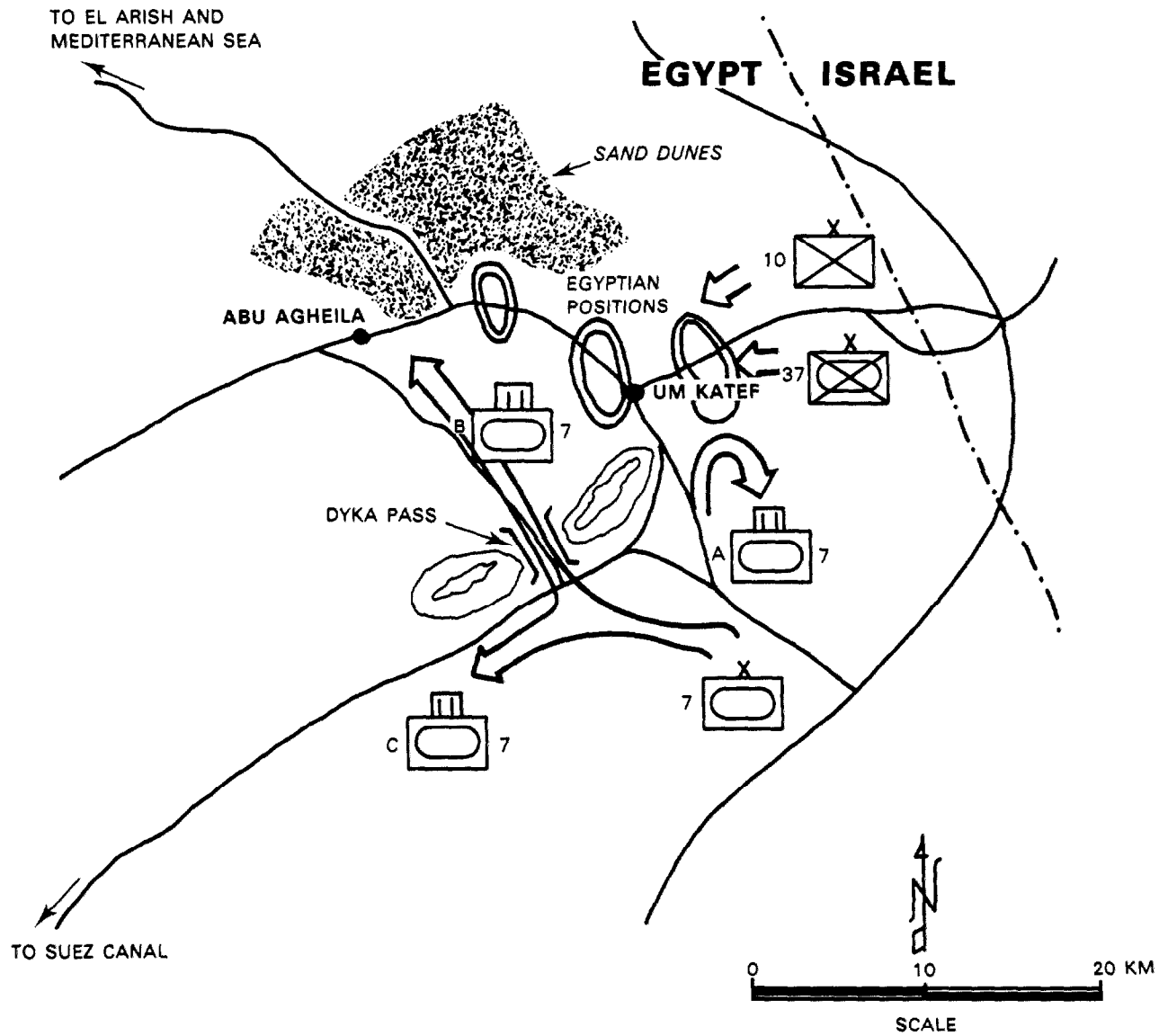
Still, the instrument that Dayan planned to use for the 1956 campaign was not a mechanized force. On the contrary, he depended on the Israeli strengths in small-unit leadership and light infantry operations. An airborne drop at the critical Mitla Pass would assist the ground infantry columns, which moved across the desert in commandeered commercial vehicles, plus a few light tanks and artillery pieces. Initially, Israel's only armored brigade, the 7th, remained in reserve, with no mission except to use its tank guns as additional indirect-fire weapons.

The 7th was a fairly typical armored brigade of the immediate post-World War II period.[44] It consisted of a battalion of Sherman medium tanks, a battalion of AMX-13 light tanks, a battalion of half-track mounted infantry, a reconnaissance company, and an artillery battery. The brigade commander, Col. Uri Ben-Ari, was dissatisfied with his symbolic role, and

almost derailed the entire Israeli plan by crossing the border too early. His reconnaissance company penetrated the poorly guarded Dyka Pass on the southern flank of the key Egyptian position of Abu Agheila-Um Katef (Map 10). Although this reconnaissance indicated that the road through the pass would support only a few vehicles, Ben-Ari took a calculated risk and committed his three cross-attached task forces on three different axes to fracture the Egyptian defense. Task Force A attacked in vain against the southern side of the Um Katef defenses, where two other Israeli brigades were already making expensive frontal assaults. Task Force C exploited to the southwest, towards the Suez Canal. Ben Ari sent Task Force B, consisting of one company of Sherman tanks and one company of mechanized infantry, through the Dyka Pass and into the middle of the Egyptian position. The task force commander, Lt. Col. Avraham Adan, held this position against limited Egyptian attacks from two directions and strafing by his own aircraft. Only the 7th Brigade's artillery battery gave Adan effective support. This small task force greatly discouraged and confused the Egyptian defenders in the area, who felt that their line of communications had been cut. The frontal infantry attacks were therefore able to overrun the Egyptians.

The 7th Armored Brigade did not win the 1956 war by itself, yet its actions at Abu Agheila and elsewhere convinced Dayan that armored forces were a superior instrument for future wars of maneuver. During the decade after 1956, the Israeli Defense Forces gave the armored corps almost as high a priority for men and material as the air force and paratroopers received. As deputy commander of the Armor Corps from 1956 to 1961, and commander after 1964, Israel Tal shaped Israeli armor into an effective force. Tal soon discovered that complicated armored tactics and equipment required the same discipline and methodical maintenance that had long been common in western armies, but which were rare in Israeli forces.

The main problem was that Israel lacked the resources to maintain a superior air force and elite paratroop element while still developing a balanced mechanized army. Tal got the government to purchase modern American and British tanks and to improve the older Shermans, but the rest of the armored force suffered. Most of the Israeli infantry still rode in the 1941-vintage M3 American half-track, a vehicle with no overhead protection, limited side armor, and increasing maintenance and mobility problems as it aged. Tal insisted that the tank-mechanized infantry team was a European tactic that was less important in the Middle East. In the open spaces of Sinai, Israeli tanks needed less infantry security against short-range enemy antitank weapons. To Tal, infantry was useful for reducing bypassed centers of resistance and mopping up after the battle. Otherwise, he agreed with the British in North Africa, who had considered ordinary infantry more a burden than a help.[45]



Map 10. 7th Armored Brigade at ABU AGHEILA, 1956.

The Six Day War of 1967 seemed to confirm these arguments. The set-piece attacks conducted by teams of Israeli infantry, paratroops, artillery, and tanks to break open the Egyptian border defenses were forgotten in the euphoria of another armored exploitation to the Suez Canal. The technology of 1941 half-tracks could not keep pace with the technology of 1961 tanks, either under fire or across difficult terrain. The close and constant assistance of the Israeli Air Force made army air defense and field artillery seem unimportant, especially in fluid operations when the Air Force could arrive more quickly than the artillery could deploy. Consciously or otherwise, Israel came to rely largely on the tank-fighter-bomber team for its victories.

Israel: The Failure of Combined Arms, 1967 to 1973

Many of these trends continued and intensified after the 1967 success. The Israeli armored force grew from nine armored and two mechanized brigades in 1967 to an estimated sixteen armored and four to eight mechanized brigades by 1973. The rest of the army remained relatively stable in size. Because Israeli doctrine regarded the tank as the best means of defeating other tanks, the Israeli Defense Forces refused an American offer to supply new TOW ATGMs.[47]

Armor became the main avenue for promotion in the Israeli Army. Aside from the small number of paratroop units, no mechanized infantry officer could expect to command above company level without first qualifying as an armor officer. Israel distinguished between paratroop, conventional, and mechanized infantry, with the latter being part of armor branch, but having the lowest priority for quality recruits. Most conventional and mechanized infantry units were in the reserve, where they received less training and priority than tanks. For example, the three armored brigades located in the Sinai when the 1973 war began had all their tanks and crews at a high level of availability, but their mechanized infantry components were still in the unmobilized reserve. These brigades went into battle as almost pure tank forces.[47]

As commander of the armor corps from 1969 to 1973, Maj. Gen. "Bren" Adan, the task force commander at Abu Agheila in 1956, tried to reverse these developments. He assigned higher quality recruits to the mechanized infantry forces of the Israeli Army, only to have those recruits seek reassignment away from such an unprestigious branch. Adan also tried to obtain large numbers of M113 armored personnel carriers to replace the dilapidated M3s. Upon becoming chief of staff in 1972, Gen. Israel Tal opposed this purchase. Tal argued that the true role of mechanized infantry, if it had a role, was to fight mounted, as in the West German doctrine. Although the M113 was a considerable

improvement over the M3, neither vehicle had enough armor protection and firepower to act as the MICV Tal sought. The Chief of Staff therefore opposed spending scarce funds on a good but not perfect vehicle.[48] Israel continued to emphasize the tank and the fighter-bomber to the neglect of other arms.

This neglect was also apparent in Israeli unit structures. Despite the great increase in the Israeli Army, all echelons above brigade remained ad hoc task forces, rather than deliberate designs to integrate an appropriate balance of arms.

By contrast, the Egyptian Army carefully analyzed its weaknesses and strengths between 1967 and 1973. Indeed, one reason for its initial success in the 1973 war was that for the first time the Arabs initiated a war with Israel according to a detailed plan, rather than having Israel conduct a preemptive attack. Moreover, President Anwar Sadat recognized that a holy war to destroy Israel completely was impossible. In 1972 he appointed a new staff and commanders to plan a rational, limited war.[49]

This staff recognized the same problems that Dayan had exploited since 1948. Egyptian leadership and control procedures could not react quickly to sudden changes in mission, and the Egyptian troops became demoralized rapidly in a maneuver battle where Israeli troops could bypass them and attack from unexpected directions.

The classic World War II solution to this problem would be to prepare the troops psychologically to continue fighting when cut off and surrounded, and then develop a defense-in-depth to absorb Israeli armored attacks before they could penetrate. Yet the Egyptians recognized the lack of cohesion and mutual trust in their units and, therefore, sought a different answer to their problem. They planned to force the Israelis to attack Egyptian positions at a time and place of the Egyptians' choosing. This would allow the Egyptian soldier to fight at his best, stubbornly defending his own position from frontal attack without worrying about his flanks or his fellow soldiers. To do this, the Egyptians planned a surprise attack across the Suez Canal, the line of contact between Egypt and Israel since the 1967 war. This attack would isolate the small Israeli outposts known as the "Bar Lev Line" along the eastern bank of the canal. Egyptian units that were not involved in this attack surrendered their ATGMs and surface-to-air (SAM) missiles to the assault echelons, who therefore had three times the normal complement of such weapons. The first waves of these well-armed troops rushed about four kilometers east of the canal and then set up defensive positions. When the local Israeli armored reserves

counterattacked to relieve the Bar Lev outposts, the missile-armed Egyptian infantry faced perfect targets of pure tank units without infantry or fire support.

The decision to defend only a few kilometers east of the canal also enabled the Egyptians to seek shelter under the integrated air defense system that they had constructed with Soviet materials on the western bank. Israeli aircraft suffered heavily when they tried to support their armor inside the range of the Egyptian SAMs.

The Egyptians also profited from the famous Israeli method of command, which depended on leaders operating well forward and communicating with each other in a mixture of slang and codewords on the radio. The Egyptian Army jammed many of the Israeli command nets and captured codebooks that enabled them to interpret messages they could not jam. Moreover, Israeli commanders committed the classic mistake of becoming personally involved in local battles instead of directing their troops. On the night of 8 October 1973, the third day of the war, an Israeli brigade commander, battalion commander, and artillery commander all risked themselves to rescue personally the garrison of one of the outposts that had escaped to the east. Their involvement showed an admirable concern for the safety of their troops, but left them unable to coordinate and control the battle.[50]

The Arab armies also made mistakes in 1973. In contrast to the carefully prepared Egyptian plan, Syria attacked on the Golan Heights in a rigid carricature of Soviet doctrine, with all units moving on a fixed schedule and no one assigned to mop up bypassed centers of resistance. Soviet advisors may have taught these tactics because they considered Arabs incapable of more sophisticated operations. Israeli armor fought these dense masses from prepared tank positions that minimized the target presented to the Syrians. The defenders moved between engagements, rather than leaving their positions to maneuver during a battle. Although hard pressed, the Israelis were able to halt and counterattack the Syrians, despite the tremendous initial advantage the Syrians had in numbers and surprise. Syria then appealed to Sadat for help, and thus on 14 October 1973 the Egyptians gave up most of their advantages by attacking eastward into Sinai, away from their prepared infantry positions and air defense umbrella. By this time, nine days into the war, all surprise was lost, and the Israeli forces in Sinai were fully mobilized and ready to fight.[51]

In the ensuing days, the Israelis arrived at improvised solutions to their immediate problems. Airborne units functioned as conventional and even armored infantry, because of the low regard armored commanders had for their own mechanized infantry.

After counterattacking and crossing to the west side of the canal, the Israeli forces concentrated on eliminating Egyptian SAM sites, destroying the integrated air defense system, and thereby allowing the Israeli Air Force to provide more support.

Still, the 1973 war completed the cycle in which the Israeli Defense Forces almost exactly repeated the experience of the German Wehrmacht in the use and misuse of mechanized forces. Like the Germans in World War I, the Israelis before 1956 had regarded tanks as specialized weapons that they could not afford to maintain. In 1956 a few armored experts like Col. Ben Ari showed the Israeli commanders the value of mechanized units for penetrating and disorganizing thin enemy defenses, just as Guderian had taught his seniors in 1939-40. Nineteen sixty-seven was the heyday of the Israeli blitzkrieg, but then, like the Germans before them, they came to rely on the main battle tank and the fighter-bomber to the neglect of the other arms. Once their Arab opponents developed more effective means of antitank and antiaircraft defense and adjusted their defensive systems to the threat of armor penetration, the Israeli commanders found mechanized operations almost as difficult as the Germans had found them in 1942-45. Blitzkrieg was still possible, but it required much greater combat power and much less reliance on psychological confusion than had been the case in earlier campaigns.

The Aftermath of 1973

As the most significant mechanized war since 1945, the 4th Arab-Israeli War of 1973 attracted immense concern and study by all professional soldiers. The Israelis themselves were understandably reluctant to talk about the detailed problems they had encountered. The renewed Israeli interest in organic mortars for maneuver battalions and increased procurement of armored personnel carriers certainly indicated that they placed greater stress on the need for fire support and mechanized infantry to support their armor.

At the time of the 1973 war, the U.S Army was just reorienting its doctrine and force structure to deal with the Soviet threat in Europe. It was therefore natural that the U.S. would seize upon the Israeli example as an indicator of future tactical problems. For much of the 1970s, the influence of Israeli experiences on the U.S. was evident in such areas as the great emphasis placed on ATGMs and on fighting from hull-down positions to wear down a numerically superior mechanized opponent.

Yet the lessons of 1973 and indeed of the entire Israeli experience are sometimes obscure. First, the Israeli Army is organized and trained to fight only one type of war in a

relatively narrow variety of terrain; conclusions about the way that the Israeli Army fights may not apply to some of the many possible situations for which the U.S. Army must prepare. Second, as noted above, the Egyptian defensive system along the Suez Canal in 1973 was an artificial one, carefully crafted to use concentrations of antitank and air defense weapons that were far above what any army in the world issues to its field units. Moreover, since 1973 the development of ceramic armor has made the shaped-charge warhead ATGM significantly less effective. Third, the Israelis played into Egyptian hands by neglecting combined arms organization and practice, producing artificially high tank losses that gave a mistaken impression about the future role of armor.

What is clear from the 1973 war is that all weapons and arms, and especially high performance aircraft, are quite vulnerable on modern battlefields. This realization simply reinforces the need for mutual support by different weapons to negate the threats posed to other arms. To cite one obvious example, since 1973 suppression of enemy air defense has become a much higher priority for ground units if they wish to have friendly rotary and fixed-wing aircraft support the ground battle.

Thus in some ways, the experience of the Israeli wars revalidates the experience of World War II. Successful operations in mechanized warfare require not only combined arms organization, but also compatible equipment, so that all arms and services can move over the same terrain with the same degree of protection. Combined arms training must ensure that the different arms and the aviation assets can actually cooperate with each other on a complicated battlefield. ATGMs and air assault or army aviation units must be integrated into existing organizations and practices, instead of treated as special cases.

CONCLUSION

Summary

Prior to World War I, the various combat arms existed independently of each other, with very little doctrine or training in cooperation. Thoughtful professional soldiers frequently discussed the concept of combining the different arms for mutual support, but in practice such combination was the exception rather than the rule, at least below the level of a division or corps. In particular, there was profound disagreement over the organization and role of field artillery on the battlefield and the degree of cooperation needed between artillery and maneuver forces. Some armies, notably those of Germany and Japan, became aware of the importance of indirect fire to aid the infantry while protecting their own artillery from enemy fire. Other armies, especially the French, maintained the tradition of massed artillery in a direct-fire role to suppress enemy defenses at close range.

More generally, professional soldiers were acutely conscious of the effects of the new firepower developed during the previous century. However, even where official doctrine allowed for dispersion and maneuver to minimize the attacker's exposure to firepower, professionals felt compelled to accept the risks of a relatively dense attack. They believed that the need for a quick victory and the inadequate training of their conscript and reservist troops left few alternatives to such attacks.

After an initial period of maneuver warfare in which prewar doctrine seemed to justify itself at least inpart, European nations gradually developed the elaborate trench systems of 1915-18. Restoring mobility on the battlefield required a number of developments. First, all armies had to apply and refine procedures for indirect-fire support. Between 1915 and 1917, the British, French, and German field artillery learned how to place massed fire on any preplanned target, although targets of opportunity remained difficult to engage. Mapping and survey techniques, aerial and ground forward observer procedures, and concern for such variables as weather, ammunition production quality, and the wear of the gun tubes all became common. However, this preplanned fire was possible only because of a series of rigid phase lines and schedules of targets, with no means to change the firing once it began and little opportunity for the infantry to communicate with its supporting artillery.

During the same period, infantry regained some of its firepower and mobility by developing the weapons and organization which have dominated that branch ever since. Led by the French, European armies produced and issued mortars and rifle grenade

launchers for indirect fire, automatic rifles and light machine guns for mobile direct fire, and small caliber accompanying guns to reduce enemy strongpoints. With these weapons came the familiar infantry structures of today: a section or squad integrating rifles, grenade launchers, and an automatic weapon, and companies and battalions combining such maneuver elements with heavier support weapons. The German Army then mastered these new weapons and organization, giving infantry the tactics to advance or defend in a decentralized, flexible manner. The linear deployment of infantry that had been used to maximize firepower for three centuries was no longer necessary; the target that infantry presented to enemy fire was thus reduced.

Developments in Allied artillery and infantry could not accomplish much without changes in command, control, and communications. Even if the artillery succeeded in suppressing the power of enemy defensive fires, the infantry had to struggle forward across No Man's Land with no means of communicating either with the guns or with higher headquarters. Long delays ensued while the advancing infantry sent runners and telephone messages up the chain of command and waited for decisions to come back down that same chain. General officers had to command from the rear, because the inflexible nature of telephone communications and the poor visibility inside the trenches made control from the front almost impossible. Even when the commander was able to receive information and communicate in a timely manner, supplies, artillery, and reinforcements all had to cross zones of destruction produced by the attacker's own artillery preparations. By contrast, the German defenders accepted the risk of allowing junior commanders on the spot to make independent decisions and even to commit the reserves of their parent units, thereby increasing the difference in decision-cycle times between French and British attackers and German defenders. Hence the trenches largely immobilized opposing armies, even when German infiltration tactics or the Allied artillery-infantry-tank-aircraft team achieved tactical successes.

By 1918 most armies had come to imitate the German doctrine of defense-in-depth, leaving only lightly held outposts in the forward area and thereby absorbing enemy artillery preparations and infantry attacks forward of the intended main line of resistance.

Nevertheless, the seeds of future combined arms attacks were present in 1918. German infiltration tactics in the west and the British cavalry exploitation in Palestine both acted as forerunners for the mechanized doctrine of their respective countries.

Between the world wars a number of factors common to all nations hampered the development of such doctrine and practice. Anti-war sentiment, tight defense budgets, and the huge stockpiles of 1918 equipment all discouraged innovation. Confusing terminology, the extreme and contradictory claims of various abrasive but visionary theorists, and constant changes in technology also made it difficult for professional soldiers to develop a rational basis for changes in equipment, organization, and doctrine. Despite such problems, few armies stood still, although they varied in the exact compromise they reached along the long continuum between military conservatism and total mechanization.

Great Britain could not afford to become so mechanized that its battalions were unable to function in the low intensity operations required to police the British Empire. This need for one army to fight in various types of war foreshadowed the even greater problems of the U.S. Army since 1945. For Britain between the wars, this restriction, plus the problems described above and a number of unfortunate experiments with mechanization, caused the nation that developed the tank to lose its lead in armored warfare during the 1930s. Instead, British armor developed in two divergent directions, a pattern repeated to some extent in the French and American armies of the same period. British armor and cavalry officers sought tanks that were lightly armed and armored, providing the mobility to function as armored cavalry both in Europe and the empire. On the other hand, slow, heavily armored tanks were still necessary to support the deliberate infantry attack. As a consequence, no British vehicles or armored organizations emphasized firepower. Even the British infantry, which improved its mobility somewhat by developing lighter and more effective weapons, lacked effective antitank capability in 1939. Only the Royal Artillery had such a capability, and it had neglected the indirect-fire experience of World War I.

In Germany, the determination of Heinz Guderian and other visionaries, plus the limited support of Adolf Hitler, produced the panzer division. Guderian built a fully mechanized force in which all arms were integrated, although the service and maintenance elements were never as mobile as the units they supported. As in other armies, the traditional combat arms controlled some of Germany's mechanized equipment, but two-thirds of the available armored vehicles remained concentrated in the panzer divisions by 1939. Germany's first tanks were in some ways inferior to those of France and Britain, but the Germans produced such equipment several years before the hasty rearmament of their opponents. Thus, the panzer units had enough equipment in their hands before the war to train and experiment extensively.

Prior to 1937, the lead in mechanized warfare belonged to the Red Army. From the Russian Civil War of 1918-21 to the present, the Soviets have been remarkably consistent in their doctrine. This doctrine envisioned a "deep battle" fought by combined arms mechanized formations that could rupture conventional enemy defenses and then simultaneously attack all echelons of that defense with artillery, paratroops, air strikes, and the maneuver of mechanized "mobile groups." However, the Red Army purge of 1937-41 was a major factor which caused the Soviets to fall behind Germany, producing the incredible unpreparedness that contributed to the initial German victories of 1941-42.

If the Soviet Union was the most advanced in military doctrine between the world wars, France was the most conservative. The French reserve system was inferior in quantity and quality to that of 1914, reinforcing French commanders in their belief that only methodical, set-piece operations of the World War I variety were possible. The same reserve system prompted the French government to construct the Maginot Line. The purpose of this line was not to hold the Germans indefinitely, but to act as a shield for French mobilization and as an anchor for French maneuvers in the low countries. The cost of the Maginot Line, the limitations of French industry, and the French distrust of elite standing armies all delayed the formation of armored divisions until the war began, denying French soldiers the experience and training that their German counterparts had gained in the last years of peace. When Germany invaded France in 1940, French armor was largely dispersed in an infantry support role, or functioning as mechanized cavalry in Belgium, too far from the main German thrust to redeploy under the rigid French command structure. In any event, France lacked sufficient troops to establish an effective defense-in-depth and maintain counterattack forces to repel German penetrations.

The United States was heavily under French influence during the 1920s, but did develop new structures and doctrine in the following decade. The triangular infantry division gave the United States Army, at least on paper, a more mobile, responsive, and strategically deployable force than it had had in World War I. Unfortunately, the organizational concepts of that division required significant modification under the test of combat. Also during the interwar years, the U.S. Field Artillery School far outstripped its European competitors by inventing the fire direction center procedures that allowed massed artillery to concentrate rapidly on targets of opportunity. Such centralized and flexible fire direction has been a major advantage of all subsequent American field units.

Germany's initial victories in 1939-41 defined blitzkrieg as the standard for mechanized combined arms. Although all armies

eventually developed the psychological and technical capability to react to the blitzkrieg, the principles involved had considerable merit. The German panzer division was a combined arms mechanized formation in which the balance between the arms improved as the war progressed, and in which all elements had trained to regroup and reorganize to meet different conditions. The principal role of this force was exploitation, encirclement, and pursuit after a more conventional attack penetrated the enemy defenses on a narrow, concentrated frontage. This exploitation was not a random scattering of forces; German commanders strove to focus the actions of their subordinate mechanized units throughout the battle, seeking to disorganize and encircle the enemy forces. After the success of 1940, the limited German capability for close air support expanded to assist the ground units in such operations.

In German hands, these tactics produced difficulties that were not immediately apparent to observers. In their heyday, German tankers concentrated on exploitation, leaving antitank guns, not tanks, to defeat enemy armor. From 1942 onward, by contrast, the Germans redesigned their equipment to put increasing responsibility on the tank-aircraft team for both penetration and antitank defense. When Germany's opponents developed effective antitank defenses and challenged German air superiority, this system fell apart. Germany denied the infantry, artillery, and other elements of the panzer force the production priorities that they needed to remain equal partners with the increasingly sophisticated German tanks. Moreover, limited transportation and maintenance assets had restricted the German force from the start, making sustained operations such as those in the Soviet Union a tremendous strain.

Poor deployments, training, and command and control were largely responsible for the British and French defeat in 1940. The British response was to readjust both organization and training. Gradually infantry, armor, artillery, and antitank forces became equal partners in the British armored division at home, although the forces in North Africa were too pressed by combat to adjust until 1942. At the same time, Gen. Bernard Montgomery led a group of officers who used large-scale exercises to develop a common set of concepts and procedures for mobile warfare. Realizing that the British Army still had slow command procedures and considerable branch prejudices, Montgomery "stage-managed" large unit operations to ensure integration of all elements of the combined arms teams. The result, while much less responsive and fluid than the German battlegroups, at least enabled the British to use their forces to best advantage.

The Soviet Union also had to change its organization and training in response to the German menace. German accounts of

the war in the east usually describe the Red Army during 1941-42, the period when Soviet leadership and staff procedures were poorest, and when the necessities of the moment forced the Soviets to abandon temporarily their prewar organization and doctrine. Beginning in 1942, however, the Red Army rebuilt its tank and mechanized forces and retrained its leaders to solve the problems of penetration and exploitation against the Germans. Popular German accounts rarely speak of these techniques, which became standard by 1944-45. In the deliberate attack, the Soviets used deception operations and selective massing on narrow frontages to achieve an overwhelming superiority at a few points even when they could not claim such superiority across the entire front. A wave of task-organized company- and battalion- sized units then initiated the offensive by fighting to develop information about the enemy and to occupy German outposts. Combined arms assault groups reduced specific strongpoints, while heavy tanks, medium tanks, assault guns, engineers, infantry, and artillery cooperated to push rapidly through the main German defenses. Once this penetration developed, combined arms forward detachments led the larger mechanized formations in rapid exploitation, seeking to preempt German efforts to organize a new defensive line.

As remarked before, the U.S. Army entered the war with a triangular infantry division that was designed to adjust its combat power by frequent attachment and detachment of specialized units. Unfortunately, most commanders concluded that the infantry division was incapable of sustained attack or defense without such attachments under all circumstances. Moreover, frequent changes in these attachments caused much inefficiency and misunderstanding between those attachments and the gaining divisions. Thus, the U.S. infantry and armored divisions, although nominally small and strategically mobile, actually fought as larger formations because of the habitual attachment and association of nondivisional armor, antitank, antiaircraft, field artillery, and transportation assets. At least some of these attachments became organic to the division structures when the U.S. Army recognized the reality of its practice after the war.

The other developments of World War II were obvious to everyone. The shaped-charge antitank warhead allowed all arms to acquire limited capacity to kill tanks with low-velocity guns and rockets. The demands of infantry units for long-range antitank defense and for armor support in the attack produced a number of tank surrogates, primarily armored assault guns. Most nations, including Germany, had considerable difficulties in achieving effective air-ground cooperation, because air commanders saw only the inefficiency and limited destructive capacity of close air support, while ground commanders appreciated the rapid response

and psychological effect of such support. Although this issue did not prevent temporary cooperation between air and ground forces on the battlefield, air-ground problems were symptomatic of the larger difficulties of coordination and combination when all operations became joint service, and most combined the forces of more than one nation.

Since 1945, the atomic bomb has called into question the entire role of land combat and has certainly made massing on the World War II model quite dangerous. In the 1950s and 1960s, the Soviet response to this new development was to organize and equip their ground forces for an armor-heavy exploitation, with penetration left to nuclear fires. Since the late 1960s, however, the Soviets have recognized the possibility of renewed conventional warfare and have restudied the lessons of World War II while restoring the balance of arms within their divisions and regiments.

The U.S. Army, by contrast, faced challenges not only from nuclear warfare, but also from insurgencies and a variety of other conflicts around the world. The necessity to fight any war any place at any time with only a handful of divisions places a tremendous burden on American doctrine and organization, a burden rarely understood by America's allies or even the general public. The skeleton configuration of garrison forces in the later 1940s was inadequate to fight a limited conventional war, while the pentomic division structure of the 1950s lacked the flexibility of command and control required to fight in nonnuclear environments. The requirements of flexible response to a variety of possible threats go far to explain not only the ROAD structure, with its variety of strategic and tactical task organizations, but also the American emphasis on firepower to make up for inadequate forces and mobility in different environments. Airmobility is another major new development that promises to give the U.S. Army both firepower and mobility on the battlefield, but only if the U.S. has the strategic transportation assets to move bulky helicopters and large amounts of supplies to an overseas battlefield.

Today Israel and many of America's NATO Allies are not confronted with the prospect of conducting extended contingency operations outside of their own regions; they need only limited forces for such contingencies. Thus, the British, French, and German armies have tended to standardize on integration of mechanized assets at smaller unit levels, producing fixed organizations equivalent in size to an American brigade or armored cavalry regiment. Israel was also able to focus on a limited number of possible conflicts. The tremendous armored successes of 1967 and the lack of resources in a small nation led the Israelis to repeat the error of Germany in World War II,

relying on the tank and fighter-bomber to the neglect of the other combined arms. This error, plus the limited variety of terrain and threat that Israel faces, make generalizing lessons from the Arab-Israeli wars to other future conflicts rather hazardous.

Trends and Principles

Certain trends or principles recur in all these developments. Some of these trends are so self-evident that the military rarely discusses them, yet because they have survived the test of different technologies and armies over different periods, they merit some attention.

First, major armies have tended to integrate more and more arms and services at progressively lower levels of organization, in order to combine different capabilities of mobility, protection, and firepower while posing more complicated threats to enemy units. Integration does not necessarily mean combining individual weapons or even companies of different arms together in a permanent organization in garrison; indeed, such a fixed structure would be almost as dangerous tactically as the current organization, because battalions and companies could not adjust the balance of weapons in response to varying terrain, enemy, or mission. To be effective the different arms and services must train together at all times, changing task organization frequently. When making such changes in task organization, however, it is more effective to begin with a large combined-arms unit, such as a division or fixed brigade, and select elements of that unit to form a specific task force, rather than to start with a smaller brigade or division and attach nondivisional elements to that formation. In the former case, all elements of the resulting task force are accustomed to working together and have a sense of unit identity that can overcome many misunderstandings. In the latter case, confusion and delay may occur until the nondivisional attachments adjust to their new command relationships and the gaining headquarters learns the capabilities and limitations of these attachments. Frequent changes in the partnership of units, especially changes that are not practiced in peacetime, will produce inefficiency, misunderstanding, and confusion. Only the need to adjust the proportion of arms to different tactical situations limits the degree to which those arms can be grouped together permanently.

One corollary is that all arms and services need the same mobility and almost the same degree of armor protection as the units they support. Not only infantry, engineers, field artillery, and air defense, but also logistics units need to be able to go where the tank units go in order to conduct sustained operations.

Another corollary is that the arms must be balanced within an organization, grouped together to perform according to a particular doctrine. Units above battalion level in which one arm dominates the others numerically may be useful in certain circumstances, but lack flexibility. Similarly, specialized arms and elites of all kinds, like the tanks and tank destroyers of World War II, have special capabilities that must be balanced against their vulnerability when not supported by other arms.

A fourth trend is the continuing problem of air-ground cooperation. Artillery and infantry learned to function together in World War I, and with much difficulty tanks, antitank weapons, engineers, and antiaircraft artillery joined that team during and after World War II. Yet the aircraft is still not integrated into the combined arms team. In three wars since 1941, the U.S. Army and U.S. Air Force have had to develop ad hoc compromises and procedures for air-ground cooperation because their peacetime training and doctrine were always inadequate. To some extent, the development of the helicopter has been an army effort to acquire a capability that receives low priority in the air force. As General Howze argued at the time that the air assault team developed,

> We drew a parallel to the indirect fire support available to the infantry company commander. That gentleman had call on battalion 4.2-inch mortars, brigade 105-mm howitzers, division 155-mm and eight-inch howitzers, and 240-mm howitzers. Even so, he would not give up that crummy little platoon of three 81-mm mortars that was part of his own company. For he had to ask no one's permission to use them--they were totally responsive, always available, a precious asset even though a small part of the total firepower backing up the infantry company.[1]

The United States is not unique in suffering this problem; even the German Luftwaffe and army had similar disagreements during World War II. Until the legitimate concerns of both services are adjusted, air support of ground forces will remain a broken reed at the start of each new conflict.

A final problem of combining the different arms and services is the difficulty of defense against enemy penetration. The Germans in 1915-17, the Allies in 1939-42, and the Egyptians in 1956 and 1967 have all suffered in this regard. Few armies have the time and troops in peacetime to train in the establishment of a true defense-in-depth, to prepare their troops psychologically as well as technically to continue to fight when penetrated and bypassed by enemy forces. In the mid-1970s, the U.S. Army

conducted such preparation as part of the "Active Defense" doctrine in Europe, only to be maligned by critics who considered that doctrine too oriented on defense and on firepower. If anything, however, the true test of an army's skill in combined arms is its ability to reorient and orchestrate the different arms under the pressure of a fast-moving enemy attack.

Abbreviation used in the notes:
CARL-U.S. Command and General Staff College Combined Arms Research Library, followed by the document call number.

INTRODUCTION ENDNOTES

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CHAPTER ONE ENDNOTES

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